3.5 Terrestrial Resources

3.5.1 Area of Analysis

The Klamath Hydroelectric Settlement Agreement (KHSA) area of analysis or "project area" for terrestrial resources impacts includes vegetation communities and habitats of the Klamath River watershed currently influenced by the presence of the Four Facilities. Both the riparian vegetation communities downstream from these dams and the associated reservoirs upstream are influenced by the presence of the dams and have the potential to be affected by their removal. Thus, the project area extends along the Klamath River from Keno Dam to the Pacific Ocean and includes the river channel and riparian zone. Upland habitats occurring in construction areas are also included in the project area. This would include areas potentially affected by changes in land use and water supply patterns caused by the KHSA. In addition, the area of analysis includes areas where Klamath Basin Restoration Agreement (KBRA) actions would occur, particularly the Lower Klamath, Tule Lake, and Upper Klamath National Wildlife Refuges in the Klamath Basin National Wildlife Refuge System (Figure 3.5-1). Most KBRA actions would occur within the Upper Klamath Basin, but some would also occur in the Lower Klamath Basin (excluding the Trinity River watershed), and are included in the area of analysis.

3.5.2 Regulatory Framework

Terrestrial resources within the area of analysis are regulated by several federal, state, and local laws and policies, which are listed below.

3.5.2.1 Federal Authorities and Regulations

- Endangered Species Act (7 USC § 136; 16 USC § 1531 et seq.)
- Fish and Wildlife Coordination Act (16 USC § 661 et seq.)
- Migratory Bird Treaty Act (16 USC § 703 et seq.)
- Clean Water Act (33 USC § 1251 et seq.)
- Executive Order 11990- Protection of Wetlands (42 FR 26961)
- Executive Order 11988- Floodplain Management (42 FR 26951)
- Bald and Golden Eagle Protection Act (16 CFR 668)
- National Wildlife Refuge Administration Act, as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 USC § 668dd et seq.)
- United States Fish and Wildlife Service (USFWS) Biological Opinion
- Northwest Forest Plan
- Noxious Weed Act (7 USC § 2801 et seq.) and Executive Order 13112 Invasive Species (64 FR 6183)

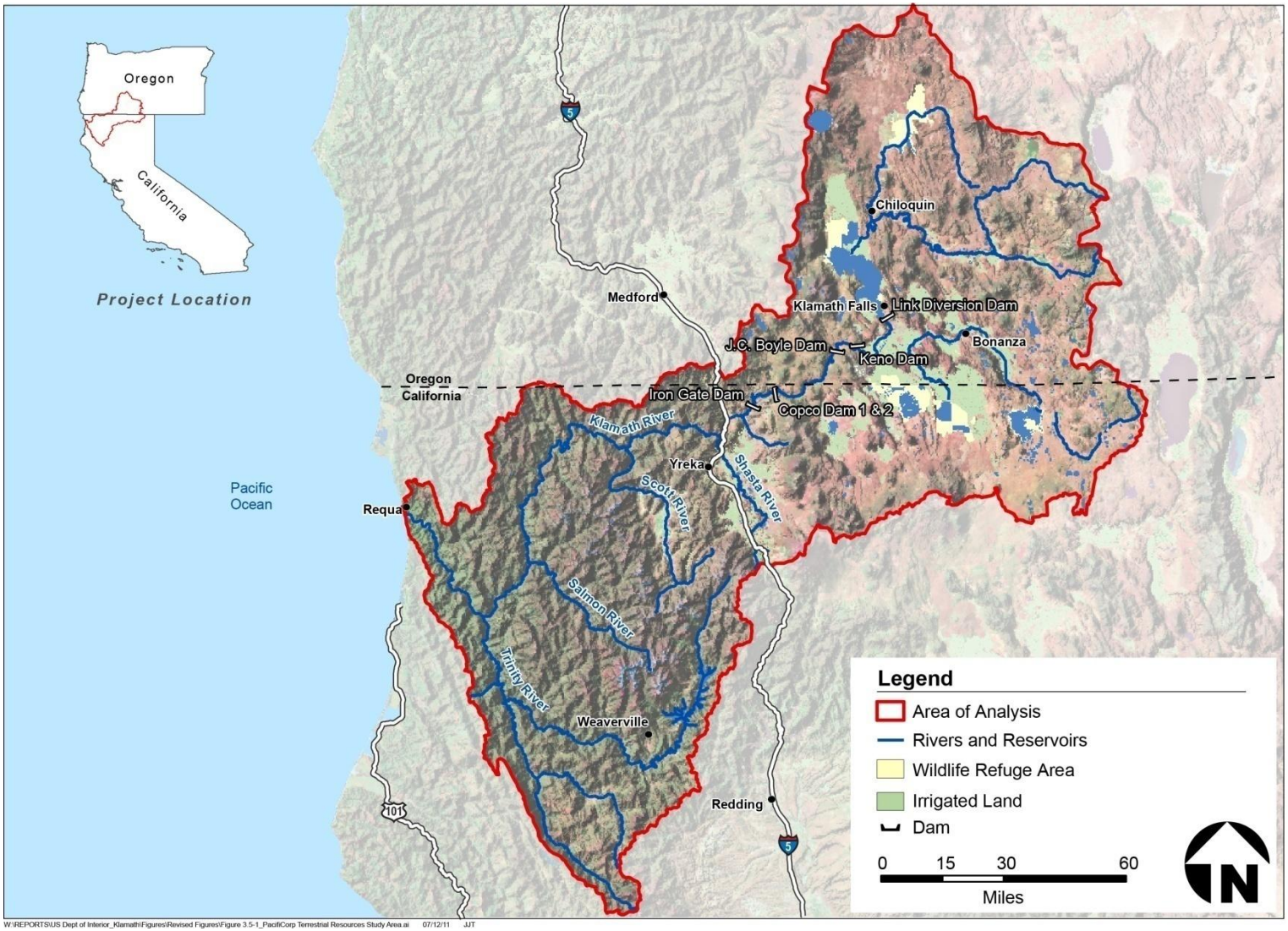

Figure 3.5-1. PacifiCorp Terrestrial Resources Study Area

3.5.2.2 State Authorities and Regulations

- California Endangered Species Act (California Fish and Game Code [FGC] Section 2050 et seq.)
- Migratory Bird Protection (FGC Sections 3500 - 3705)
- Streambed Alterations (FGC Section 1600)
- Exotic Species Introductions (California Food and Agriculture Code Section 403)
- Oregon Endangered Species Act (Oregon Revised Statutes [ORS] 496 et seq.)
- Oregon Removal-Fill Law (ORS 196 et seq.)
- Oregon Noxious Weed Control Law (ORS 561)

3.5.2.3 Local Authorities and Regulations

- Siskiyou County General Plan (1973)
- Humboldt County General Plan (1984)
- Del Norte County General Plan (2003)
- Klamath County Comprehensive Plan (2010)

3.5.3 Existing Conditions/Affected Environment

The project area is within the Klamath Ecological Province and the Klamath Bioregion, characterized by forested mountains and a fairly wet climate that supports large river systems. Vegetation communities include wetter forests near the coast, including white fir and Douglas fir, transitioning to drier mixed conifer-pine and mixed conifer-fir in the mountain ranges of Siskiyou County. Sagebrush and interior valley vegetation communities also exist within lower elevation areas. In Oregon, the project area is within the East Slope Cascades and the West Slope Cascades eco-regions. In California, the project area is within the Southern Cascades and the Modoc Plateau physiographic provinces and is also within the Cascade-North Sierra floristic region of the California floristic province (Federal Energy Regulatory Commission [FERC] 2007).

The Klamath-Siskiyou mountain ranges are recognized for their biological diversity, with more than 3,000 known plant species, including 30 temperate conifer tree species, more than any other ecosystem in the world (California Department of Fish and Game [CDFG] 2006). The Klamath River Canyon is a mosaic of pine, oak, juniper, and mixed conifer forest communities, with ponderosa pine and Oregon white oak being the dominant tree species. Riparian habitats are dominated by oak, birch, and white alder (FERC 2007).

3.5.3.1 Vegetation Communities and Habitat Types

The majority of the information in this section was obtained from the PacifiCorp Final Technical Report (FTR) on terrestrial resources prepared for the Klamath Hydroelectric Project (PacifiCorp 2004a). The "primary study area" for the terrestrial resources technical report included the Klamath River from the Link River Dam to the Shasta River and the area within 0.25 mile of all PacifiCorp facilities, reservoirs, and river reaches. PacifiCorp also identified a "secondary study area" that included the area between the canyon rims from J.C. Boyle Dam to the eastern end of Copco Reservoir and all PacifiCorp-owned lands near the PacifiCorp facilities (Figure 3.5-2).

"Study area" in this section refers to the area covered by the terrestrial resources FTR, whereas "project area" refers to the area of analysis defined in Section 3.5.1. The terrestrial resources FTR study area does not include the Klamath River downstream of Shasta River, and information on vegetation communities is not available to the level of detail presented in the terrestrial FTR for the downstream reaches of the Klamath River.

Unless specified, information on terrestrial resources in the lower Klamath River was obtained from the following sources:

- Draft Hydrology, Hydraulics, and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration (Greimann et al 2010), which discusses the general physical characteristics of the Klamath River reaches;
- *Green Diamond Resource Company Aquatic Habitat Conservation Plan and Candidate Conservation Agreement with Assurances* (Green Diamond Resource Company 2006), which provides information on habitat and occurrence of southern torrent salamander and tailed frog in the lower Klamath River reaches;
- *Mid-Klamath Subbasin Fisheries Resource Recovery Plan* (Karuk Tribe of California 2003), which covers the Klamath River between Iron Gate Dam and the Trinity River;
- *The Lower Klamath River Sub-Basin Watershed Restoration Plan* (Yurok Tribal Watershed Restoration Program 2000), which covers the Klamath River between the Trinity River and the Pacific Ocean; and
- *Klamath River Estuary Wetlands Restoration Prioritization Plan* (Yurok Tribe Environmental Program 2009), which covers the Klamath River Estuary.

The study area for the PacifiCorp FTR includes 11 river reaches of the Klamath River upstream from the Shasta River, as listed in Table 3.5-1.

Table 3.5-1. River Reaches in the PacifiCorp Study (2004a)

River Reach	River Mile
Link River	253.3 to 254.8
Keno Impoundment	233.3 to 253.3
Keno Canyon	228.2 to 233.3
J.C. Boyle Reservoir	224.6 to 228.2
J.C. Boyle Bypass	220.2 to 224.6
J.C. Boyle Peaking Reach	203.9 to 220.2
Copco 1 Reservoir	198.7 to 203.9
Fall Creek	0 to 1.5*
Copco 2 Bypass	196.8 to 198.7
Iron Gate Reservoir	188.9 to 196.8
Iron Gate-Shasta	176.8 to 188.9

Source: PacifiCorp 2004a
Notes:
*River Mile of Fall Creek

Eight vegetation cover types were mapped by PacifiCorp (2004a), with each cover type further sub-classified. Appendix G includes a series of 18 vegetation maps covering the PacifiCorp study reaches. These figures and a description of each cover type are included in Appendix G. Table 3.5-2 lists the major cover types and their relative distribution and acreage among the river reaches and Table 3.5-3 lists the sub-classifications of each cover type. PacifiCorp considered Copco 1 and Copco 2 as one reservoir during their study, and collectively referred to them as Copco reservoir (PacifiCorp 2004a). The methods used by PacifiCorp to map vegetation communities in the study area are summarized in Appendix H.

As shown in Table 3.5-2, upland tree habitat occupies 54 percent of the study area and is the most abundant cover type in all locations except at Keno Impoundment and along the Klamath River, from the Iron Gate development to the Shasta River, where aquatic and wetland cover types dominate at Keno Impoundment and upland herbaceous cover types dominate at Klamath River from Iron Gate Dam to Shasta River. Upland shrub habitat occupies 9.5 percent of the study area and is particularly abundant near the Copco 2 bypass reach. Upland herbaceous habitat occupies 9.2 percent of the study area and is common along the Klamath River between the Iron Gate development and the Shasta River (25.5 percent) and at the Iron Gate (21 percent) and Copco Reservoirs (16 percent).

Barren habitat, consisting of rock talus (rubble at the bottom of a slope or cliff) or exposed rock, occupies 1.7 percent of the study area. Agricultural and developed habitat (excluding general grazing allotment areas) occupies 11 percent of the study area, primarily along Link River, at Keno Impoundment, and along the Klamath River from Iron Gate development to the Shasta River. Developed and agricultural lands dominate the area near Keno Impoundment (48 percent), and consist primarily of pasture or irrigated hayfields.

Wetland and riparian vegetation in the project area is influenced by water flow and level in the river and reservoirs and sediment flow and deposition through the system. Wetland habitat consists of emergent marsh, shrub-scrub wetlands, and forested wetlands and occupies only 4.2 percent of the study area. Wetland habitat occurs primarily at the Keno Impoundment (19.5 percent of wetland habitat in the study area), the J.C. Boyle Reservoir (5.5 percent of wetland habitat), and Copco Reservoir (1.3 percent of wetland habitat). Iron Gate Reservoir contains 60 acres of wetland habitat, or only 0.9 percent of total wetland habitat. Aquatic habitat (open water habitat largely devoid of vegetation) occupies 9.6 percent of the study area, with the highest percentage (22.4 percent or 2,136.6 acres) occurring at the Keno Impoundment.

Riparian habitat occurs along the river and reservoir shorelines in some areas and consists of deciduous, shrub, and grassland vegetation. Riparian habitat occupies only 1.1 percent of the study area. Along the river reaches, reed canarygrass is a common riparian plant species in high flow areas. Reed canarygrass may outcompete other riparian species due to its ability to better use abundant nutrients and withstand frequently fluctuating peaking flows. Along the banks above high flow areas, most river reaches have even distribution

of coyote willow/reed canarygrass/colonial bentgrass, perennial ryegrass, and Oregon ash/colonial bentgrass/woolly sedge (PacifiCorp 2004a).

Wetland and riparian vegetation occurs to varying degrees along the project reservoirs. The majority of this habitat is limited to small patches in protected locations and near inlets/tributaries. However, several large wetland and riparian habitats are associated with the Keno Impoundment and J.C. Boyle Reservoir. Both the Copco Reservoir and Iron Gate Reservoir have steep slopes that generally lack extensive, near-shore riparian and wetland habitat. Emergent vegetation within the wetland and riparian communities of the reservoirs includes sedge, rush, bentgrass, bulrush, and cattail. Coyote willow is the dominant shrub layer of the wetlands at reservoirs in the project area (PacifiCorp 2004a).

Noxious Weeds and Invasive Plant Species

During biological surveys conducted in 2002, 2003, and 2004, 17 species of noxious weeds were identified within the study area. The noxious weed inventory fieldwork emphasized areas around PacifiCorp facilities, roads, transmission lines, and at reservoirs, riverine shorelines, and riparian areas from the Link River to the mouth of the Shasta River. In addition, data from resource agencies on noxious weeds was obtained to supplement surveys for a 0.25-mile wide (0.4-km-wide) buffer around PacifiCorp structures, reservoirs, and river reaches (PacifiCorp 2004a).

During the surveys, the following 17 noxious weed species were found in the study area:

- Bull thistle (*Cirsium vulgare*)
- Canada thistle (*Cirsium arvense*)
- Cheatgrass (Bromus tectorum)
- Diffuse knapweed (*Centaurea diffusa*)
- Dalmatian toadflax (*Linaria dalmatica*)
- Dyer's woad (Isatis tinctoria)
- Hoary Cress (*Cardaria draba*)
- Mediterranean sage (*Salvia aethiopsis*)
- Medusahead (Taeniatherum caput-medusae)
- Perennial pepperweed (*Lepidium latifolium*)
- Puncture vine (Tribulus terrestris)
- Russian knapweed (*Acroptilon repens*)
- Scotch thistle (Onopordum acanthium)
- Scotch broom (Cytisus scoparius)
- Spiny cocklebur (*Xanthium spinosum*)
- St. John's wort (Hypericum perforatum)
- Yellow starthistle (*Centaurea solstitialis*)

In addition to the species listed above, reed canarygrass is an invasive plant species found throughout the project area.

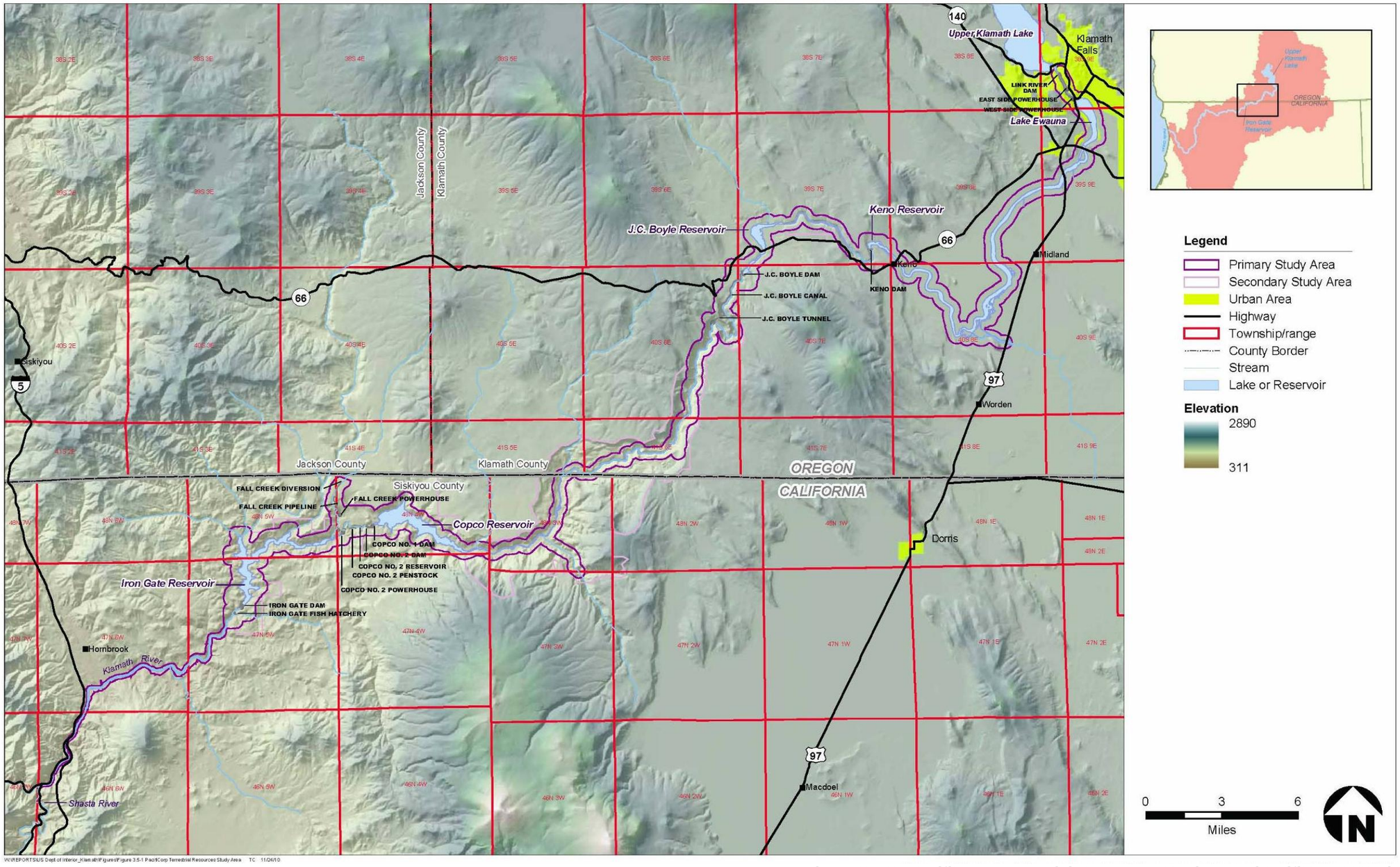

Figure 3.5-2. PacifiCorp Terrestrial Resources Study Area (PacifiCorp 2004a)

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Table 3.5-2. Distribution of Vegetation Cover Types Mapped in 2002 in the PacifiCorp Study Area (2004a)

Vegetation Cover Type	Iron Gate-Shasta	Iron Gate Reservoir	Copco 2 Bypass	Fall Creek	Copco Reservoir	J.C. Boyle Peaking Reach	J.C. Boyle Bypass	J.C. Boyle Reservoir	Keno Canyon	Keno Impound-ment	Link River	Grand Total
Upland Tree												
Subtotal	135.1	3,472.5	714.4	692.1	3,159.0	15,400.9	1,465.2	1,136.8	1,599.4	304.6	237.3	28,316.9
Percent of Reach	9.7%	52.7%	59.4%	74.6%	51.2%	75.3%	70.6%	59.1%	78.0%	3.2%	42.2%	53.6%
Upland Shrub												
Subtotal	205.8	478.4	251.7	102.6	791.2	1,851.2	285.9	120.0	259.3	607.5	88.7	5,042.2
Percent of Reach	14.8%	7.3%	20.9%	11.1%	12.8%	9.1%	13.8%	6.2%	12.6%	6.4%	15.8%	9.5%
Upland Herbaceous												
Subtotal	353.5	1,383.8	80.4	28.7	962.5	1,675.8	109.6	171.6	24.7	46.8	3.4	4,840.6
Percent of Reach	25.5%	21.0%	6.7%	3.1%	15.6%	8.2%	5.3%	8.9%	1.2%	0.5%	0.6%	9.2%
Wetland												
Subtotal	0.6	60.1	4.5	13.5	79.2	89.9	14.1	105.1	5.1	1,860.8	5.6	2,238.5
Percent of Reach	0.0%	0.9%	0.4%	1.5%	1.3%	0.4%	0.7%	5.5%	0.2%	19.5%	1.0%	4.2%
Aquatic												
Subtotal	218.5	964.9	10.0	0.9	999.6	277.1	45.5	299.4	92.3	2,136.6	32.3	5077.1
Percent of Reach	15.8%	14.7%	0.8%	0.1%	16.2%	1.4%	2.2%	15.6%	4.5%	22.4%	5.7%	9.6%
Riparian												
Subtotal	151.1	41.8	23.1	39.9	25.6	228.3	32.1	0.8	20.3	0.8	33.9	597.5
Percent of Reach	10.9%	0.6%	1.9%	4.3%	0.4%	1.2%	1.6%	0.0%	1.0%	0.0%	6.0%	1.1%
Barren												
Subtotal	17.4	63.1	82.6	38.3	61.4	545.0	96.0	10.2	12.3	0.0	0.0	926.2
Percent of Reach	1.3%	1.0%	6.9%	4.1%	1.0%	2.7%	4.6%	0.5%	0.6%	0.0%	0.0%	1.7%
Agricultural/ Developed												
Subtotal	304.4	120.3	35.5	11.7	96.3	379.6	28.0	80.7	37.2	4,575.8	161.0	5,830.5
Percent of Reach	22.0%	1.8%	3.0%	1.3%	1.6%	1.8%	1.3%	4.2%	1.8%	48.0%	28.6%	11.0%
Total Acres	**1,386.4**	**6,585.1**	**1,202.2**	**927.7**	**6,174.7**	**20,447.8**	**2,076.1**	**1,924.5**	**2,050.6**	**9,532.9**	**562.1**	**52,869.5**
Percent of Total	**2.6%**	**12.5%**	**2.3%**	**1.8%**	**11.7%**	**38.7%**	**3.9%**	**3.6%**	**3.9%**	**18.0%**	**1.1%**	**100.0%**

Table 3.5-3. Sub-Classification of Vegetation Cover Types Mapped in 2002 in the PacifiCorp Study Area (2004a)

Upland Tree Habitats	**Wetland Habitats**	**Barren Habitat**
Montane Hardwood Oak	Palustrine Emergent	Rock Talus
Montane Hardwood Oak-Conifer	Palustrine Scrub-Shrub	Exposed Rock
Montane Hardwood Oak-Juniper	Palustrine Forested	
Juniper	Palustrine Aquatic Bed	**Agricultural/Developed**
Mixed Conifer		
Lodgepole Pine	**Riparian Habitats**	
Ponderosa Pine	Riparian Grassland	
	Riparian Shrub	
Upland Shrub Habitats	Riparian Deciduous	
Mixed Chaparral	Riparian Mixed Deciduous-Coniferous	
Rabbitbrush		
Sagebrush	**Aquatic Habitat**	
	Riverine and Lacustrine Unconsolidated Bottom	
Upland Herbaceous Habitats	Riverine and Lacustrine Unconsolidated Shore	
Annual Grassland		
Perennial Grassland		

In addition to these species, other invasive species occur throughout the project area, including the middle and lower Klamath River reaches. These species include reed canarygrass, Japanese and Himalayan knotweed, and Himalayan blackberry (personal communication with J. Hamilton, USFWS, January 7, 2011). In addition, poison hemlock (*Conium maculatum*) is a common noxious weed present along the shores of Keno Impoundment (personal communication with R. Larson, USFWS, March 13, 2011).

During the PacifiCorp vegetation surveys, cheatgrass, yellow starthistle, and medusahead were the most widespread noxious weed species across all 11 of the study area sections. Bull thistle and Canada thistle were also pervasive in the study area (PacifiCorp 2004a). Noxious weeds occurred in 62 percent of the sampled riparian/wetland sites. Many of the weed species occur in uplands or near the riparian/upland interface. In general, noxious weeds were found to be abundant where ground disturbance had occurred. The spread of these weeds likely occurs as a result of vehicles or machinery spreading weed seeds and propagules in areas where bare soil is exposed. Ground disturbance has resulted from various land uses and maintenance activities in the study area, including maintenance of power plants, transmission lines, flowlines, recreation sites, and roads. The abundance of weeds at Keno Impoundment may be the result of agricultural development and livestock grazing. In addition, residential and commercial developments contribute to the spread of these invasive plants (PacifiCorp 2004a).

In addition to the surveys conducted by PacifiCorp (2004a), vegetation surveys were conducted around the perimeter of J.C. Boyle, Copco, and Iron Gate Reservoirs in November 2009 and July 2010 (United States Department of the Interior [DOI] 2011). These surveys confirmed the presence of yellow starthistle and medusahead at Copco and Iron Gate Reservoirs, but did not find these species at J.C. Boyle Reservoir. However, large stands of reed canarygrass were documented along the eastern shoreline of the northern section of the J.C. Boyle Reservoir.

Upper Klamath River

The Upper Klamath River includes the areas upstream of J.C. Boyle Reservoir. Findings of vegetation and wildlife surveys conducted for the PacifiCorp study (2004a) in the Link River Reach, Keno Impoundment, and Keno Canyon Reach are summarized below. As described in Section 3.5.1, the area of analysis for this Environmental Impact Statement/Environmental Impact Report (EIS/EIR) also includes areas of the Upper Klamath Basin where KBRA actions would occur, particularly those areas associated with the National Wildlife Refuges (NWRs). Lower Klamath, Tule Lake, and Upper Klamath NWRs would be most directly affected by the KBRA (USFWS 2010). These NWRs are managed to provide habitat and food for waterfowl. As such, they consist largely of seasonal and permanently flooded marshes with emergent and submergent wetland vegetation. In addition, a large amount of croplands surrounding these wetlands provide food for wintering waterfowl.

Link River Reach

The Link River is the headwaters reach of the Klamath River just above Lake Ewauna near the city of Klamath Falls. The Link River Dam and its reservoir (Upper Klamath Lake) are not part of the project area for the Klamath Hydroelectric Settlement Agreement, but are part of the area that would be affected by the KBRA.

In addition to being affected by river hydrology and seepage from canals and penstocks, user-created trails and encampments and maintenance activities have adversely affected riparian vegetation along the Link River reach through ground disturbance that precludes vegetation growth. The riparian vegetation along the right bank is structurally diverse and relatively continuous, while the vegetation on the left bank is more disturbed and patchy. Vegetation in the reach has an abundance of introduced woody species, including apple, plum, and elm (PacifiCorp 2004a).

Keno Impoundment

Keno Impoundment is not part of the project area for the Klamath Hydroelectric Settlement Agreement, but is part of the area that would be affected by the KBRA. Keno Impoundment has a surface area of 2,475 acres. As with the other project reservoirs, wetlands at the Keno Impoundment are influenced by the hydrology of the reservoir. However, the water level at the Keno Impoundment fluctuates less than at the other reservoirs, and the wetlands occur in naturally low-lying areas that probably supported significant wetlands before formation of the Keno Impoundment (PacifiCorp 2004a).

The wetland vegetation at Keno Impoundment is more diverse than at any other project reservoir, with the most abundant wetland vegetation types dominated by hardstem bulrush and broadfruited bur-reed. Applegate's milk-vetch (*Astragalus applegatei*), a federally endangered and Oregon endangered species, was documented during surveys at Keno Impoundment (PacifiCorp 2004a). See Table 3.5-4 in Section 3.5.3.4 for a discussion of special-status species that occur in the project area. The coyote willow vegetation type, which is dominated by coyote willow in the shrub layer, is not common at the Keno Impoundment, but occurs in dense, small stands in low-lying pastures protected by levees. The tops of the levees are dominated by noxious weed species, such as poison hemlock and Canada thistle (PacifiCorp 2004a). The noxious weed, perennial pepperweed (*Lepidium latifolium*), also occurs in wetlands along the Keno Impoundment and is likely to be present on private lands (personal communication with R. Larson, [USFWS], March 13, 2011).

Keno Canyon Reach

The Keno Canyon reach has steep slopes with a narrow shoreline. The reach experiences low flows in the growing season, resulting in the growth of intact, undisturbed riparian grass vegetation dominated by reed canarygrass. Willow reproduction in the Keno Canyon reach is lacking, and existing willow trees are in a state of decay with large horizontal branches broken because of rot or chewing by beavers (PacifiCorp 2004a). There is a mostly intact transition from the riparian zone to the upland zone that consists primarily of shrub vegetation on the canyon slopes. Some riparian areas are disturbed from recreational use by fishermen.

J.C. Boyle Reservoir

The water level in J.C. Boyle Reservoir is controlled at the J.C. Boyle powerhouse and by inflows from upstream irrigation. As a result, there are wide mudflats exposed on a daily basis in some portions of the reservoir, and there is no woody riparian/wetland vegetation immediately along the shoreline. In spite of water fluctuations, the wetland vegetation at the reservoir is diverse and largely undisturbed, with patches of dense emergent marsh in low-gradient areas. Areas that are fenced and protected, such as at the mouth of Spencer Creek, support high quality woody and herbaceous riparian and wetland vegetation. In contrast, wetlands along the northwest shoreline are highly disturbed by cattle grazing (PacifiCorp 2004a).

J.C. Boyle Bypass and Peaking Reaches

The J.C. Boyle bypass reach generally has a stable water level with low flows, supporting reed canarygrass as well as sedges and willows. A canal with long steep slopes covered by boulders runs along the bypass reach. At the end of the canal is a spillway below which vegetation is lacking due to scour from periodic high flows (PacifiCorp 2004a). In both the J.C. Boyle bypass and peaking reaches, Oregon oak and Oregon ash are dominant tree species, with arroyo willow and coyote willow also common (PacifiCorp 2004a).

Approximately two-thirds of the riparian habitat in the J.C. Boyle bypass reach is riparian grassland, which is predominately reed canarygrass (Administrative Law Judge 2006). The high prevalence of reed canarygrass in this area is a result of current low flows. Project operations have adversely affected riparian resources in both the J.C. Boyle bypass and peaking reaches by supporting the perpetuation of reed canarygrass and by affecting the structure, size, and nature of depositional features (Administrative Law Judge 2006).

The J.C. Boyle peaking reach has a generally lower gradient and supports large stands of shrub and tree-dominated riparian vegetation. Wetland habitat occurs on wide benches above the banks that are used for hay production and pasture. Some parts of this reach are accessible to cattle grazing. Many of these wide terraces along this reach are used as large irrigated pastures. Irrigation has created vertical and horizontal discontinuity in the riparian vegetation along the river and reduced cover of native herbaceous and woody riparian vegetation. As a result, exotic and non-native invasive species such as Himalayan blackberry, whitetop, and non-native pasture grasses, have become established (PacifiCorp 2004a).

Copco 1 and Copco 2 Reservoirs

PacifiCorp considered Copco 1 and Copco 2 as one reservoir during their study, and collectively referred to them as Copco Reservoir (PacifiCorp 2004a). Along the shorelines of Copco Reservoir, wetlands are highly disturbed in many areas by a variety of land uses, including livestock grazing and recreational fishing. At the shoreline, the low herbaceous vegetation is heavily grazed and has an abundant "weedy" component of yellow starthistle and medusahead in many locations. Willow habitat is limited to areas

where the steep banks of the reservoir shorelines are eroding to form benches upon which coyote willow has become established (FERC 2007).

During invasive plants surveys conducted in November 2009 and July 2010, yellow starthistle was only observed growing on the northern side of the reservoir, where it occurs in dense stands in some areas (DOI 2011a).

Copco 2 Bypass Reach

In the Copco 2 Bypass Reach, a dense riparian community of white alder dominates, likely prohibiting shade-intolerant coyote willow and reed canarygrass in this reach. Low river flows and water levels in this reach have provided substrate for the establishment of riparian and wetland vegetation consisting of native and non-native hydrophilic herbaceous species that form a relatively sparse herb layer under the dense white alder canopy (PacifiCorp 2004a).

Iron Gate Reservoir

Wetland and riparian areas along the shorelines of Iron Gate Reservoir are highly disturbed by livestock grazing. The reservoir has moderately steep slopes. Along the larger tributaries of Jenny, Scotch, Dutch, and Beaver Creeks, some tree-dominated riparian habitat occurs, and consists of Oregon ash, Oregon oak, and white alder. Shining willow also occurs at Iron Gate Reservoir.

During invasive plant surveys conducted in November 2009 and July 2010, yellow starthistle was documented as prolific in the dry upland slopes and near roadsides around Iron Gate Reservoir (DOI 2011a).

Fall Creek Reach

Fall Creek is a tributary to the Klamath River just upstream from Iron Gate Reservoir. In the Fall Creek Reach, there is a unique abundance of conifers in the riparian zone, and coyote willow is absent. Four riparian/wetland vegetation types occurring along Fall Creek include Oregon ash/western birch, Oregon ash/Douglas' spiraea, white alder, and ponderosa pine/Douglas fir/western serviceberry, which typically occurs in drier and more upland areas (PacifiCorp 2004a).

Middle Klamath River

The Mid-Klamath subbasin includes the lower Mid-Klamath and the upper Mid-Klamath. The upper Mid-Klamath includes all watersheds from Iron Gate Reservoir downstream to Seiad Creek, excluding the Scott and Shasta Rivers, while the lower Mid-Klamath includes the mainstem of the Klamath River and all watersheds from Grinder Creek downstream to Weitchpec, excluding the Salmon River (Karuk Tribe of California 2003).

The upper Mid-Klamath subbasin has an interior montane climate. Vegetation within the Klamath Range is primarily mixed conifer/hardwood forests while vegetation in the Great Basin consists of chaparral, sagebrush, and juniper woodland. Riparian habitat in the upper Mid-Klamath is affected by a variety of land management practices, including grazing and irrigated agricultural lands, dams and diversions, gravel mining, and roads (Karuk Tribe of California 2003).

The Klamath River from Iron Gate Dam to Shasta River contains the highest percentage (10.9 percent; Table 3.5-2) of riparian habitat in the PacifiCorp (2004a) study area. In most of the reach, the floodplain is mostly restricted to narrow terraces between the in-channel alluvium and steeper slopes or higher elevation surfaces. The narrow terraces typically support coyote willow, shining willow, Oregon ash, and Oregon oak. Cattle grazing in many areas have degraded these stands, as well as some of the coyote willow stands growing on in-channel bars. Even so, woody riparian vegetation is more abundant in this reach than in any other reach of the study area, although tree-dominated stands are typically much smaller in area than in other reaches, due to recreation development on the larger floodplain surfaces between Iron Gate Dam and Cottonwood Creek. Reed canarygrass is not common along the river downstream of Iron Gate Dam for unknown reasons (PacifiCorp 2004a).

Langley Falls is along the middle Klamath River at Gottsville, where several tributaries enter from the north and form a large alluvial fan complex that constricts the river. At the lower end of the Middle Klamath River, Seiad Valley lies where large alluvial fans from Seiad Creek, Little Grider Creek and Grider Creek form a wider alluvial valley with large unvegetated gravel bars (Griemann et al 2010).

The lower Mid-Klamath subbasin has a coastal–influenced, Pacific-maritime climate, grading to interior climates of the Klamath Range. The Klamath River and tributaries in this portion of the project area generally have steep slopes and are vegetated with mixed hardwood/conifer forests with mixed conifer evergreen and true fir forests upslope. Riparian habitat in the lower Mid-Klamath has been altered primarily by timber harvest, gravel mining, roads, and fire suppression (Karuk Tribe of California 2003). Several reaches of the middle Klamath River in this area have been extensively mined. Unvegetated gravel bars are common. Major tributaries include the Salmon River, Trinity River, Bluff Creek, Camp Creek and Ukonom Creek (Griemann et al 2010). The middle Klamath River runs through both the Klamath National Forest and the Six Rivers National Forest.

Lower Klamath River and Klamath River Estuary

The Lower Klamath subbasin extends from the confluence of the Klamath and Trinity Rivers to the Pacific Ocean. The coast redwood groves are unique to this part of the project area. Vegetation types are similar to that of the lower Mid-Klamath subbasin, with mixed hardwood/conifer forests dominant. However, based on habitat surveys conducted in 1996 and 1997, conifers comprise less than one third of the riparian canopy in lower Klamath tributaries. Riparian areas are dominated by deciduous trees including red alder, which are less able to stabilize streambanks than coniferous trees. Red alder is the most common hardwood in riparian zones, and tanoak is the most common mid to upper slope hardwood, with Pacific madrone occurring as a minor stand component on drier sites (Green Diamond Resource Company 2006). Grazing, timber harvest, and roads have degraded riparian habitat in the Lower Klamath (Yurok Tribal Watershed Restoration Program 2000).

The Klamath River estuary lies where the Klamath River enters the Pacific Ocean. A mile-long spit extends from the south shore of the estuary. The estuary is shallow and is about 2,500 feet long and up to 1,000 feet wide. The river channel in the estuary changes positions often as a result of large flood events, during which most of fine-grained sediments are flushed to the ocean (DOI 2010).

The estuary consists of several wetland complexes, which have been altered to varying degrees from their historical condition. Large wetlands have been converted into grass pastures for cattle or sown for hay, and hydrology has been altered for the construction of roads including U.S. Highway 101. In addition, many tributaries to the estuary have been straightened and lack connection to the floodplain (Yurok Tribe Environmental Program 2009). The lower channel of the estuary was extensively cleared of snags and large woody debris at the turn of the century for commercial gillnetting and navigational purposes (Green Diamond Resource Company 2006).

Freshwater emergent wetland vegetation dominates the estuary. The estuary also supports a number of salt-tolerant species. Invasive species, including reed canarygrass *(Philaris urundinacea),* Himalayan blackberry *(Rubus procerns),* and common reed *(Phragmites australis*) also occur, particularly in areas of disturbed soil. Beaver activity in the estuary helps to create and maintain wetland conditions through the building and maintenance of beaver dams (Yurok Tribe Environmental Program 2009).

3.5.3.2 Culturally Significant Species

Many plants, especially wetland plants, in the project area are culturally important to Indian Tribes in the Klamath River region for food and basketry (Larson and Brush 2010). Among these plants are ipos (roots of *Carum oregonum*), desert parsley (*Lomatium canbyi*), camas bulbs, cattail roots, and wocas (yellow pond lily seeds). Wild celery, wild parsley, and wild rhubarb were gathered along with hazelnuts, acorns, and pine nuts and the fruits of chokecherries, serviceberries, Klamath plums, elderberries, blackberries, gooseberries, wild grapes, and huckleberries (FERC 2007).

All of the tribes in the Klamath basin collect materials from along the Klamath River for making baskets that are used in various ceremonies. Willows *(Salix spp.)* and ferns *(Pteridophyta)* are both common species used in making basketry and regalia, and are important medicinal plants used in healing and ceremony (Yurok Tribe Environmental Program 2009). Tribes commonly collect young willow shoots from gravel bars within riparian areas. Other plant materials used in basket-making include pine, redwood and spruce roots, and grapevine (FERC 2007).

3.5.3.3 Wildlife

The project area supports a large number and diversity of wildlife species. During PacifiCorp surveys conducted in 2002 and 2003, 225 vertebrate wildlife species were detected or confirmed from other sources as occurring in the study area, including five amphibians, 16 reptiles, 174 birds, and 30 mammal species (PacifiCorp 2004a).

Amphibians

Amphibians and some reptiles are reliant on aquatic, wetland, and riparian habitat. PacifiCorp conducted an inventory of amphibians and reptiles in 2002 and 2003 to document species occurrence and identify important habitats and sites for amphibians and reptiles within the same study area that was used for the community mapping (PacifiCorp 2004a). The focus of the study included aquatic, wetland, and riparian habitats at the reservoirs and within a 0.25 mile buffer around river reaches from Link River to Shasta River. During the surveys, biologists searched suitable aquatic and riparian habitat for adults, larvae, and egg masses, turning rocks, litter, and other cover objects and using nets to catch individuals (PacifiCorp 2004a). Amphibian and reptile surveys were also conducted in suitable upland areas and complemented surveys conducted during previous investigations. Riverine surveys for amphibians found only two amphibian species, Pacific giant salamander and Pacific chorus frog. No amphibians were found during upland surveys. Based on the 2002 and 2003 surveys as well as previous investigations, five amphibian species are known to occur in the Klamath River study area: long-toed salamander, bullfrog, Pacific chorus frog, western toad, and Pacific giant salamander. All of these species are generally restricted to ponds or other still-water habitat, except for the Pacific giant salamander, which is a stream-dwelling species. Results of the PacifiCorp study indicate that reservoirs in the study area appear to provide only marginal breeding habitat for native pond-breeding amphibians. Fluctuating water levels and predation by yellow perch and bullfrog may limit the suitability of these habitats for amphibian breeding. Existing land uses, including roads, cattle grazing, and recreational activities also affect habitat quality in the study area (PacifiCorp 2004a).

Green Diamond Resource Company conducted presence/absence surveys for tailed frogs and southern torrent salamanders (both California species of concern) in the lower Klamath River and tributary streams and found these two amphibian species to be widespread (Green Diamond Resource Company 2006). In addition, western toad and yellow-legged frog were reported in some of the tributaries of the lower Klamath subbasin during trapping studies conducted in 1991 (USFWS 1992).

Reptiles

Based on surveys conducted in 2002 and 2003 as well as previous surveys in the study area, reptile species diversity and relative abundance is considered high in the study area, particularly in the Klamath River Canyon, along the J.C. Boyle canal, and near Keno Impoundment. In total, 16 reptile species were documented in the study area. Of these, the western fence lizard was the most abundant reptile species and was found in a variety of habitats. Other reptile species found during the surveys included gopher snake, northern sagebrush lizard, western rattlesnake, southern alligator lizard, yellow-bellied racer, common garter snake, western terrestrial garter snake, and western pond turtle. The remaining seven (7) species documented in the study area were recorded as incidental observations or from other investigators and include common kingsnake, striped whipsnake, sharptail snake, ringneck snake, western skink, rubber boa, and California mountain kingsnake (PacifiCorp 2004a).

Surveys for snake hibernacula, or over-wintering locations, were conducted at six specific areas. Although no snake hibernacula locations were confirmed through 2003 surveys, several locations with suitable habitat were identified (PacifiCorp 2004a).

Birds

A portion of the project area is in the Upper Klamath Basin along the Pacific Flyway, a major north-south route of travel for migratory birds in the Americas. The Upper Klamath Basin supports the largest concentration of migratory waterfowl in North America, with up to 2 million migratory birds during peak fall migration and about half that number in peak spring migration (Jarvis 2002). Migratory birds travel along the Pacific Flyway in spring and in fall, following food sources, heading to breeding grounds, or travelling to overwintering sites. Fall migration peaks in September and October and spring migration peaks in March and April in the Upper Klamath Basin (Jarvis 2002). During these months, the wetlands of the Basin support nearly 80 percent of the Pacific Flyway's migratory waterfowl along with thousands of shorebirds and other waterbirds (Point Reyes Bird Observatory 2010).

Large numbers of water-related birds also use the Upper Klamath Basin for breeding. Several bird species have basin-wide populations of greater than 5,000 individuals during the summer months, and 11 other species exceed 1,000 individuals (Shuford et al 2004). The wetlands support large breeding colonies of American white pelicans, double-crested cormorants, eared, Western, and Clark's grebes, great egret, white-faced ibis, ring-billed gull, California gull, and Caspian, Forster's, and black terns. A large number of these species also use the Upper Klamath Basin for staging prior to breeding in California's Central Valley. The Upper Klamath Basin also supports a high number of nesting bald eagles.

Overwintering birds that occur in the Upper Klamath Basin include tundra swans, snow geese, sandhill cranes, and a large number of waterfowl, other water birds, and raptors. In addition, the Upper Klamath Basin supports the largest wintering population of bald eagles in the coterminous United States (Shuford et al 2004). Waterfowl are important prey for bald eagles in the Upper Klamath Basin (Manning and Edge 2002).

PacifiCorp conducted avian surveys in 2002 and 2003, consisting of avian point counts and area searches, protocol surveys for northern spotted owl and northern goshawk, and reservoir surveys. In addition, five Rapid Ornithological Inventories were conducted in 2002 by ornithologists from the Klamath Bird Observatory to document avian use and occurrence in riparian habitat during the fall migration. The Rapid Ornithological Inventories included mist-netting and banding along with area searches and nocturnal call-and-response owl surveys conducted during an intensive 3-day survey period in several river reaches. During these surveys, 174 bird species were detected with a total of more than 20,000 individual detections. Over 11,000 of these detections were recorded as occurring on reservoirs, with the highest number of birds found at Keno and Iron Gate Reservoirs. The importance of reservoir habitat was evidenced by the fact that approximately 67 percent of all birds documented by PacifiCorp during its field surveys were waterfowl and other water-related birds. The field surveys documented 47 species

of water birds, including 20 species of waterfowl and 19 species of open-water, marsh, and wading birds other than waterfowl (PacifiCorp 2004a).

Seven common bird species were found in all 11 PacifiCorp study area sections. These include the western wood pewee, song sparrow, Brewer's blackbird, yellow warbler (a California species of special concern), brown-headed cowbird, black-headed grosbeak, and mourning dove. Each of these species is associated with riparian and/or wetland habitat (PacifiCorp 2004a). In addition, PacifiCorp documented 19 species of birds of prey, including six species of hawk, two eagle species, three falcon species, seven owl species, and one species of vulture; eight species of woodpeckers, including acorn woodpecker, white-headed woodpecker, Lewis' woodpecker, red-shafted flicker, red-breasted sapsucker, downy woodpecker, hairy woodpecker, and pileated woodpecker; and five game bird species, including wild turkey, blue grouse, California quail, mountain quail, and mourning dove (PacifiCorp 2004a).

National Wildlife Refuges (NWRs)

Key wetland sites that support large numbers of birds in the Upper Klamath Basin include Clear Lake NWR, Klamath Marsh NWR, Lower Klamath NWR, Sycan Marsh, Tule Lake NWR, and Upper Klamath Lake (Shuford et al 2004). These large wetland complexes support the vast majority of birds in the Basin (Jarvis 2002). Of the six refuges within the Upper Klamath Basin NWR System, Lower Klamath, Tule Lake, and Upper Klamath NWRs would be most directly affected by the KBRA (USFWS 2010). For this reason, the affected environment/existing conditions of three NWRs are described in the following paragraphs. Lower Klamath NWR and Tule Lake NWR are shown in Figure 2-13; Upper Klamath NWR is shown in Figure 2-15.

Lower Klamath NWR

Lower Klamath NWR represents the remnants of historic 80,000 acre Lower Klamath Lake and is divided into a number of management units ranging from 63 acres to over 4,000 acres. Basic wetland habitat types consist of seasonal and permanently flooded marshes and winter irrigated grain fields. Seasonally flooded wetlands are critical to meeting the migratory waterfowl goals of the refuge and for providing brood areas for early nesting waterfowl species. Permanent wetlands are flooded year-round and are crucial to meeting the refuge goals of waterfowl production and habitat for fall and spring migrant waterfowl. In addition, permanently flooded wetlands provide key breeding habitat for colonial nesting waterbirds such as several heron and egret species. The emergent vegetation provides nesting substrate for many species of waterfowl, wading birds, and passerine birds and acts as cover for resting waterfowl during periods of inclement weather. The submergent plant community supports a diverse and productive invertebrate community. An additional use of permanently flooded wetlands is by molting waterfowl in July-September (USFWS 2010, Yarris et al 1994).

In addition to wetland habitats, Lower Klamath NWR also contains approximately 9,000 acres of agricultural lands including grain fields that are extremely attractive to fall migrant and wintering waterfowl and large numbers of wintering raptors, with bald

eagles being the most conspicuous. Hayfields attract large populations of spring migrant geese which helps alleviate potential damage to private farmlands off the refuge.

Lower Klamath NWR receives most of its water from two sources: 1) D Plant, which pumps water from Tule Lake through the Sheepy Ridge tunnel and 2) the Ady Canal, which supplies water directly diverted from the Klamath River. Deliveries to the refuge in recent years (since about 2004) have been limited (USFWS 2010).

Tule Lake NWR

Tule Lake NWR is comprised of approximately 17,000 acres of croplands and 13,000 acres of wetlands contained within Sumps 1(A) and 1(B). Most of the area is comprised of open water dominated by submergent plant communities with extensive periodic blooms of filamentous green algae. High fish densities in Sumps 1(A) and 1(B) make them extremely important foraging areas for fish-eating birds such as white pelicans, western and Clark's grebes, and double crested cormorants. Large areas of submerged aquatic vegetation are very important to migrating diving ducks, especially canvasback, ruddy ducks and lesser scaup (USFWS 2010).

In addition, Tule Lake NWR agricultural programs require growers to leave a proportion of small grain crops (typically 25-33 percent) standing for wildlife consumption. The high energy content of agricultural crops provides an important energy source for migrating waterfowl as they travel northward and southward in the Pacific Flyway (USFWS 2010).

Tule Lake NWR Sumps 1(A) and 1(B) primarily receive agricultural return flows during the spring/summer irrigation season and runoff during winter and spring precipitation events. Excess water in Sumps 1(A) and 1(B) is removed via a tunnel (D-Plant) through Sheepy Ridge to Lower Klamath NWR.

Upper Klamath NWR

Upper Klamath NWR is in Klamath County, Oregon, approximately 35 miles north of the California border and consists of 14,966 acres divided into two units; Hank's Marsh (approximately 1,191 acres) at the south end of Upper Klamath Lake, and Upper Klamath Marsh at the north end. Both Upper Klamath Marsh and Hank's Marsh represent relatively undisturbed remnant wetlands. Additional acreage of water storage within the Upper Klamath NWR include Agency Lake (approximately 9,000 acres) connected to the northern part of Upper Klamath Lake, and Barnes Ranch (approximately 2,000 acres) located northwest of Agency Lake. Because emergent wetlands of Upper Klamath NWR are not separated from the open waters of the lake by perimeter levees, water elevations in the lake have a direct effect on wetland water levels (USFWS 2010).

Mammals

During the PacifiCorp study, surveys for mammals included small mammal trapping, canal wildlife surveys, winter bait station and track surveys, and bat roost surveys. Common mammals that were found throughout the study area include black-tailed jackrabbit, mule deer, and California ground squirrel. Small mammals commonly found during trapping included deer mouse, bushy-tailed woodrat, least chipmunk, and montane

vole. Medium-sized mammals detected in the study area included bobcat, striped skunk, gray fox, yellow-bellied marmot, and coyote. Large mammals included deer, elk, mountain lion, and black bear. Five aquatic and/or riparian-associated fur-bearing mammals were detected: raccoon, beaver, muskrat, mink, and river otter (PacifiCorp 2004a).

3.5.3.4 Special-Status Species

During the PacifiCorp (2004a) study, focused surveys for special-status species were conducted. Appendix G includes a series of 5 maps that show the occurrences of special-status plant species and three maps that show the occurrence of special-status wildlife species observed during the PacifiCorp study (PacifiCorp 2004a). These maps are assumed to reflect current conditions, as recent comprehensive wildlife surveys have not been conducted. The methods used during these surveys are also summarized in Appendix H.

Fourteen special-status plants and 47 special-status wildlife species were detected in the PacifiCorp study area. Plant species include one federally endangered and Oregon endangered plant, Applegate's milk-vetch, and five federal plant species of concern. Wildlife species include one federal threatened species, the northern spotted owl, 15 federal species of concern, two Oregon threatened species and one California threatened species, three California endangered wildlife species, and four fully protected bird species, golden eagle, bald eagle, peregrine falcon, and greater sandhill crane; Table 3.5-4 lists these species.

In addition to those species identified by PacifiCorp as having the potential to occur, new species lists were obtained for this Klamath Facilities Removal EIS/EIR from USFWS, Oregon Department of Fish and Wildlife (ODFW), Oregon Biodiversity Information Center (ORBIC), and CDFG's California Natural Diversity Database (CNDDB). The USFWS list included species listed by the National Marine Fisheries Service. The ORBIC database search included a 0.25 mile buffer around the Klamath River and the Keno Impoundment and J.C. Boyle Reservoir within Oregon. The CNDDB search included a total of 27 United States Geological Survey 7.5-minute topographic quadrangles within which the project area is within California. A list of these quadrangles is provided in Appendix I.

Any new species that appeared on lists provided by the resource agencies (in addition to those found during the PacifiCorp study) were compiled into a comprehensive list of special-status species with some potential to occur in the project area (Appendix I). This list includes 242 special-status species: 2 invertebrates, 14 amphibians, 5 reptiles, 70 birds, 24 mammals, 115 plants, 3 bryophytes, and 9 lichens. Non-terrestrial species (fish, sea turtles, sea birds [albatross], marine invertebrates [abalone], and marine mammals) were not included here but are addressed in the Biological Assessment prepared for the project under Section 7 of the federal Endangered Species Act.

No additional plant or wildlife surveys beyond those conducted by PacifiCorp (2004b) were conducted for this EIS/EIR.

Table 3.5-4 identifies all the special-status plant species with documented occurrences in the project area based on the results of the PacifiCorp study and the ORBIC, and CNDDB searches. A total of 77 special-status species have been documented as occurring in the project area, including: 3 amphibians, 5 reptiles, 47 birds, 5 mammals, and 17 plants, based on information from PacifiCorp surveys plus occurrences documented on ORBIC and CNDDB and information provided by the USFWS.

Special-status wildlife species were found to occur in each of the 11 PacifiCorp study area sections and in every delineated habitat type except rock talus. The largest number of special-status plants and wildlife species was found in the J.C. Boyle peaking reach. Keno Impoundment, which has the highest amount of wetland and riparian habitat of the study area sections as well as limited water level fluctuations, was found to support a relatively high abundance of special-status wildlife across species groups, including the largest number of western pond turtles. Keno Impoundment also supports special-status plants including Applegate's milk-vetch (PacifiCorp 2004a; USFWS 2009).

Amphibians

Western toad was the only special-status amphibian species detected in the study area during PacifiCorp surveys; tailed frog and southern torrent salamander have also been documented in the study area during other investigations (Table 3.5-4). During PacifiCorp surveys, western toad breeding sites were confirmed in 2002 along the north shore of Iron Gate Reservoir and in the J.C. Boyle peaking reach along Way Creek. Adult toads were also reported from near the Copco 1 village. There are likely other breeding sites either along the reservoir shorelines or in small, isolated ponds throughout the study area (PacifiCorp 2004a). Tailed frog and southern torrent salamander were found to be widespread in the lower Klamath River and tributaries (Green Diamond Resources Company 2006).

No Oregon spotted frogs were detected during 2003 surveys, or during surveys conducted in 1994 at locations of historic occurrence based on the Oregon Natural Heritage Program database. The presence of non-native bullfrog throughout the study area may indicate that predation has lead to the extirpation of Oregon spotted frogs from the study area. Habitat degradation and poor water quality are other likely reasons why the Oregon spotted frog does not occur in the study area (PacifiCorp 2004a).

There is one historical record of foothill yellow-legged frog near the site of the J.C. Boyle Dam. There were no foothill yellow-legged frog detections during focused surveys in 2003, and it is likely that this species has been extirpated from the study area. This species is affected by loss of river habitat, predation by bullfrog and other aquatic predators, and desiccation or scour of egg masses resulting from flow alterations (PacifiCorp 2004a).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Amphibians				
Tailed frog	*Ascaphus truei*	CSSC	Perennial, cold, fast-flowing mountain streams with dense vegetation cover, or streams in steep-walled valleys in non-forested areas.	Widespread in tributary streams in the lower Klamath River (Green Diamond Resource Company 2006).
Western toad	*Bufo boreas*	BLM, SV, ONHP List 4	Breeds from February to early May in ponds, the edges of shallow lakes, and in slow-moving streams. Adults are common near marshes and small lakes but may also be found in dry forests, shrubby areas, and meadows.	Documented during PacifiCorp surveys along J.C. Boyle peaking reach, along the north shore of Iron Gate Reservoir, and along Klamath River near river mile 185 (between the confluence of Bogus and Cottonwood Creeks). One occurrence near Frain Ranch, Klamath River Canyon (ORBIC 2010).
Southern torrent salamander	*Rhyacotriton variegatus*	FSC, CSSC	Uppermost portions of cold, well shaded permanent streams with a loose gravel substrate, springs, headwater seeps, waterfalls, and moss covered rock rubble with flowing water.	Widespread in tributary streams in the lower Klamath River (Green Diamond Resource Company 2006).
Reptiles				
Western pond turtle	*Actinemys marmorata*	FSC, BLM, SC, ONHP List 2, CSSC	Prefers quiet water in small lakes, marshes, and sluggish streams and rivers; requires basking sites.	Documented during PacifiCorp surveys at Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs, along J.C. Boyle bypass reach, along J.C. Boyle peaking reach in California, and along Klamath River from Iron Gate Dam to Shasta River. Also documented at Iron Gate Reservoir and along Klamath River (ORBIC, CNDDB 2010).
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	FSC, BLM, SV, ONHP List 4	Inhabits sagebrush, chaparral, juniper woodlands, and dry conifer forests.	Documented during PacifiCorp surveys in the rocky riparian shrub habitat of Keno reach, along J.C. Boyle peaking reach, near J.C. Boyle powerhouse intake canal, and near the edge of a forested wetland along Iron Gate Reservoir.

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Sharptail snake	*Contia tenuis*	BLM	Inhabits moist sites in chaparral, conifer forests, and deciduous forests, but primarily occurs in oaks and other deciduous tree woodlands, particularly in the forest edges.	Known to occur along upper J.C. Boyle peaking reach west of Frain Ranch in Douglas-fir habitat but not detected by PacifiCorp during its surveys.
California mountain kingsnake	*Lampropeltis zonata*	FSC, BLM, SV, ONHP List 4	Inhabits thick vegetation along watercourses, farmland, chaparral, deciduous, and mixed-coniferous forests; specifically associated with moist river valleys and dense riparian vegetation.	Documented during PacifiCorp surveys along Copco Road and in close proximity to J.C. Boyle powerhouse intake canal. Also known to occur along J.C. Boyle peaking reach. Documented in Klamath River Canyon and at J.C. Boyle Dam (ORBIC 2010).
Common kingsnake	*Lampropeltis getula*	FSC, BLM, SV, ONHP List 4	Occurs in pine forests, oak woodlands, and chaparral in, under, or near rotting logs and usually near streams; associated with well-illuminated rocky riparian habitat with mixed deciduous and coniferous trees.	Documented during PacifiCorp surveys along J.C. Boyle peaking reach in oak/woodland and mixed conifer woodland and along Copco Road.
Birds				
Common loon	*Gavia immer*	FSC, CSSC	May over-winter on project reservoirs or occur in aquatic habitat associated with large bodies of water like the project reservoirs while migrating from sub-arctic freshwater breeding grounds to coastal and near-shore pelagic marine habitat along the Pacific coast.	Documented during PacifiCorp surveys at Iron Gate Reservoir.
American white pelican	*Pelecanus erythrorhynchos*	BLM, SV, ONHP List 2, CSSC	Nests at lakes and marshes and uses almost any lake outside of the breeding season; have a restricted range in southern Oregon and along the California border, where they are found to be associated with only a few large bodies of inland water.	Documented during PacifiCorp surveys on all project reservoirs, with the highest number occurring on Keno Impoundment, and along Link River, Keno reach, J.C. Boyle bypass reach, and on Klamath River between Iron Gate Dam and Shasta River.

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Double-crested cormorant	*Phalacrocorax auritus*	Nesting colonies are afforded special protection by CDFG.	Colonial nester on coastal cliffs, rocks, offshore islands, and along lake margins.	Documented during PacifiCorp surveys at Keno and J.C. Boyle Dams. Documented nesting colonies near mouth of Klamath River (CNDDB 2010).
Black-crowned night heron	*Nycticorax nycticorax*	FSC	Found in riparian habitats and in wetland sites.	Documented during PacifiCorp surveys primarily along Keno reach, but also along Link River, at Keno Impoundment, and along Klamath River from Iron Gate Dam to Shasta River. Communal roost used by night herons and other heron species in a group of willow trees near the East Side powerhouse adjacent to Link River.
Snowy egret	*Egretta thula*	BLM, SV, ONHP List 2	Inhabits emergent wetlands associated with freshwater marshes and along the periphery of large water bodies. The northern limit of the species range includes southern Oregon.	Documented during PacifiCorp surveys near Link River Dam, at Keno Dam, and along Keno reach.
Great egret	*Casmerodius albius*	BLM	Nests in willows and other trees; forages in shallow water, wetlands, and fields. Range includes Klamath basin and eastern Siskiyou County. Known to occur in the study area.	Documented during PacifiCorps surveys at J.C. Boyle and Keno Impoundments, Keno Canyon reach, J.C. Boyle bypass and peaking reaches, and Link River.
Great blue heron	*Ardea herodias*	Breeding colonies are afforded special-status protection by CDFG	Forages mostly in slow-moving or calm salt, fresh, or brackish water in a variety of habitats, including rocky shores, coastal lagoons, saltwater and freshwater marshes, mudflats, bays, estuaries, along the margins of rivers, lakes, and irrigation canals, and in flooded fields. Nesting colonies are typically found in groves of large trees, often in mixed colonies with other herons, egrets, and cormorants.	Documented during PacifiCorps surveys at all reservoirs and most study area reaches; colony documented at Copco Reservoir. Several rookeries documented along the Klamath River (CNDDB 2010).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
White-faced ibis	*Plegadis chihi*	FSC, BLM, ONHP List 4, CSSC	Breeds in freshwater marshes and lakes, and estuaries, and nests near the water on mats of vegetation and twigs; usually occurs in isolated con-specific flocks. Does not typically overwinter in Oregon but is a fairly common visitor in the Klamath Wildlife Area during the spring and summer.	Documented during PacifiCorp surveys along Link River and at Keno Impoundment and J.C. Boyle Reservoir.
Bufflehead	*Bucephala albeola*	BLM, SU, ONHP List 4	Typically breeds around isolated mountain lakes; nesting habitat includes mixed conifer forest and ponderosa pine forests with sparse to moderate tree canopy closure close to lakes and ponds. Nests in cavities, including artificial nest boxes. May be found in open water and riverine habitat throughout southern Oregon after the breeding season.	Documented during PacifiCorp surveys primarily from January until April along the Link River, at Keno Impoundment and Copco and Iron Gate Reservoirs.
Barrow's goldeneye	*Bucephala islandica*	SU, ONHP List 4, CSSC	Tends to breed along high-elevation mountain lakes and winter in coastal areas. Potential nesting habitat includes forests with sparse to moderate tree canopy closure next to rivers and reservoirs.	Documented during PacifiCorp surveys along Keno Impoundment, in an inundated drainage ditch off of Copco Reservoir, and on Iron Gate Reservoir. Common winter migrant on the Link River and Keno Impoundment (R. Larson, USFWS).
Osprey	*Pandion haliaetus*	CSSC	Nests in all forested vegetation types with large trees near water, as well as on platforms erected in less optimal habitat.	A minimum of 16 active osprey nests, both artificial nesting platforms and natural sites, are found along the shores of the project reservoirs and river reaches. Documented during PacifiCorp surveys along the Keno reach, along the J.C. Boyle bypass reach, along the J.C. Boyle peaking reach, at J.C. Boyle, Copco, and Iron Gate Reservoirs, along Fall Creek, and along Klamath River from Iron Gate Dam to Shasta River. Several occurrences along lower Klamath River (CNDDB 2010).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Northern harrier	*Circus cyaneus*	CSSC	Nests and forages in grasslands and emergent wetlands. Permanent residents in the project vicinity and common at the Klamath Wildlife Area.	Documented during PacifiCorp surveys in the low-lying marshland and agricultural fields east of Keno Impoundment and along Klamath River from Iron Gate Dam to Shasta River. Not listed on CNDDB for project area (CNDDB 2010).
Golden eagle	*Aquila chrysaetos*	CSSC, BCC, FP	Breeds in open mountain and hill habitats, nests in coniferous and deciduous trees and on cliff ledges, forages in grasslands and open conifer forests and woodlands with sparse to open tree canopy closure. Eagles typically use two to three nests during a lifetime.	Historical records exist of several golden eagle nests on cliffs from J.C. Boyle bypass reach to Iron Gate Reservoir. Documented during PacifiCorp surveys at J.C. Boyle powerhouse, along the lower section of J.C. Boyle peaking reach, along Copco and Iron Gate Reservoirs, and Copco bypass reach.
Bald eagle	*Haliaeetus leucocephalus*	FD, BCC, OT, ONHP List 4, CE, FP	Nests in large conifers within several miles of water; forages in rivers and lakes for fish and waterfowl; requires large snags for perching and conifers for night roosts.	Documented during PacifiCorp surveys at all project reservoirs and in all project reaches throughout the project vicinity. Also documented on Upper Klamath River, on the Klamath River near OR-CA border (ORBIC 2010), and along lower Klamath River (CNDDB 2010).
Cooper's hawk	*Accipiter cooperii*	CSSC	Inhabits riparian deciduous forest, montane hardwood oak woodland, montane hardwood oak-juniper, montane hardwood oak-conifer, juniper woodland, mixed conifer forest, ponderosa pine forest, and lodgepole pine with any level of tree canopy closure.	Documented during PacifiCorp surveys along J.C. Boyle bypass and peaking reaches, and along Klamath River from the Iron Gate Dam to Shasta River. Not listed on CNDDB for project area (CNDDB 2010).
Northern goshawk	*Accipiter gentilis*	FSC, BLM, BCC, SC, ONHP List 4, CSSC	Inhabits forested communities with at least 60 percent canopy cover and trees greater than 6 inches in diameter, except oak woodland, oak-conifer woodland, and oak-juniper woodland; forages over large home ranges.	Documented during PacifiCorp surveys flying over J.C. Boyle peaking reach. Documented near tributaries of lower Klamath River (CNDDB 2010).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Sharp-shinned hawk	*Accipiter striatus*	CSSC	Inhabits riparian deciduous forest, montane hardwood oak woodland, montane hardwood oak juniper, montane hardwood oak-conifer, juniper woodland, mixed conifer forest, ponderosa pine forest, and lodgepole pine with any level of tree canopy closure and tree diameters ranging from 6 to 24 inches.	Documented during PacifiCorp surveys in oak habitat along J.C. Boyle bypass and peaking reaches, and along Klamath River from Iron Gate Dam to Shasta River. Not listed on CNDDB for project area (CNDDB 2010).
Swainson's hawk	*Buteo swainsoni*	FSC, BLM, SV, ONHP List 4, , CT	Dwells in open country and typically inhabits sagebrush, annual grassland, juniper woodland, montane hardwood oak-juniper, and riparian deciduous forest with sparse to open tree canopy closure. The species' range generally lies east of the project vicinity and includes the plains of the Great Basin in southeast Oregon and eastern northern California.	Documented during PacifiCorp surveys flying over agricultural fields southeast of Keno Impoundment. Not listed on CNDDB for project area (CNDDB 2010).
Merlin	*Falco columbarius*	BLM, ONHP List 2, CSSC	Uses a variety of forested and open habitats. Ranges throughout North America and travels great distances during migration from breeding grounds in northern Canada and Alaska to wintering habitat through the contiguous United States south to Central America.	Documented during PacifiCorp surveys at J.C. Boyle Reservoir and along J.C. Boyle peaking reach. Not listed on CNDDB for project area (CNDDB 2010).
Prairie falcon	*Falco mexicanus*	CSSC	Uses cliffs for nesting and plateau grasslands for foraging.	Documented during PacifiCorp surveys near Keno campground and boat ramp, above J.C. Boyle bypass reach, near Copco Reservoir, and flying over Klamath Wildlife Refuge. Several occurrences listed as sensitive (CNDDB 2010).
American peregrine falcon	*Falco peregrinus anatum*	FD, BLM, BCC, OE, ONHP List 2, FP	Breeds at suitable nest sites on cliffs and rocky outcroppings. Uses a variety of habitats, including open grassland areas, forest stands, and reservoirs throughout the project vicinity.	The project vicinity is in a management area designated for peregrine falcon recovery. Known to occur along Keno Impoundment and the J.C. Boyle bypass reach but not documented during PacifiCorp surveys. Several occurrences listed as sensitive (CNDDB 2010).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Mountain quail	*Oreortyx pictus*	FSC, BLM, SU, ONHP List 4	Inhabits open forests, chaparral, and juniper woodlands with dense undergrowth offering suitable refuge; breeds in higher elevation areas; migrates on foot up to 40 miles to lower elevation winter grounds.	Documented during PacifiCorp surveys at J.C. Boyle reservoir, along the J.C. Boyle bypass reach and peaking reaches, along Fall Creek, and along Klamath River from the Iron Gate Dam to Shasta River.
Greater sandhill crane	*Grus canadensis tabida*	FSC, BLM, SV, ONHP List 4, CT, FP	Nests in marshes and wet meadows, and occasionally in pastures and irrigated hayfields. A primary requirement for suitable nesting habitat is the presence of surrounding water or undisturbed habitat.	Documented during PacifiCorp surveys east of Keno Impoundment and along J.C. Boyle reservoir. PacifiCorp located an active nest with two eggs in it in the emergent wetland bordering J.C. Boyle Reservoir. Several occurrences in the Lower Klamath Lake NWR (CNDDB 2010).
Caspian tern	*Sterna caspia*	BCC	Nests in tightly packed colonies on undisturbed islands, levees, and shores along inland water bodies during the summer breeding season. Forages over water.	Documented during PacifiCorp surveys on all project reservoirs as well as along Link River, Keno and J.C. Boyle bypass reaches, and along the Klamath River from Iron Gate Dam to Shasta River. Not listed on CNDDB for project area (CNDDB 2010).
Forster's tern	*Sterna forsteri*	BLM, ONHP List 4	Breeds at lakes and marshes and on mud or sand flats near water; forages over water.	Documented during PacifiCorp surveys along Link River, along Keno and J.C. Boyle bypass and peaking reaches, and at all project reservoirs. Not listed on CNDDB for project area (CNDDB 2010).
Black tern	*Chlidonias niger*	FSC, BLM, ONHP List 4, CSSC	Nests in emergent vegetation along the shoreline periphery of freshwater lakes, wetlands, and marshes along rivers and ponds; forages in wet meadows, pastures, agricultural fields, and water.	Documented during PacifiCorp surveys at Keno and J.C. Boyle Reservoirs. Not listed on CNDDB for project area (CNDDB 2010).
Marbled murrelet	*Brachyramphus marmoratus*	FT, OT, ONHP List 2, CE	Spends most of the time in the marine environment foraging in nearshore areas. Uses old-growth forests (coast Redwood forests in California) for nesting.	Known to occur within National Forest lands and Green Diamond Resource Company managed lands near the coast. Critical habitat has been designated near the mouth of the Klamath River.
Flammulated owl	*Otus flammeolus*	BLM, BCC, SC, ONHP List 4	Nests in abandoned woodpecker nest cavities in open forests with a ponderosa pine component.	Documented during PacifiCorp surveys along J.C. Boyle bypass and peaking reaches.

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Great gray owl	*Strix nebulosa*	BLM, S/M-C, SV, ONHP List 4, CE	Inhabits mixed conifer, ponderosa pine, and riparian mixed forest stands with trees greater than 11 inches in diameter providing at least 60 percent canopy cover within at least 984 feet of a natural or manmade opening greater than 10 acres. Breeds in tree cavities, typically near suitable open grassland foraging habitat.	Documented during PacifiCorp surveys east of Fall Creek near Jenny Creek. Not listed on CNDDB for project area (CNDDB 2010).
Northern Spotted Owl	*Strix occidentalis caurina*	FT, OT, ONHP List 1	Inhabits ponderosa pine forest, mixed conifer forest, and conifer forest with trees greater than 11 inches in diameter. Prefers old-growth forests with multi-layered tree canopies. Critical habitat occurs within the project area upstream of Copco Reservoir and south of the Klamath River and along portions of the lower Klamath River.	Documented during PacifiCorp surveys near J.C. Boyle Reservoir and along J.C. Boyle peaking reach. Several occurrences within the project area (CNDDB 2010). Known to occur within National Forest lands and Green Diamond Resource Company managed lands near the coast. Critical habitat has been designated near the mouth of the Klamath River.
Vaux's swift	*Chaetura vauxi*	CSSC	Found in mixed conifer, ponderosa pine, lodgepole pine, riparian deciduous, montane hardwood oak woodland, montane hardwood oak-conifer, and montane hardwood oak-juniper forests with trees greater than 11 inches in diameter.	Documented during PacifiCorp surveys at J.C. Boyle, Copco, and Iron Gate Reservoirs, along the J.C. Boyle bypass and peaking reaches, along Fall Creek, and along Klamath River from Iron Gate Dam to Shasta River. Not listed on CNDDB for project area (CNDDB 2010).
Black swift	*Cypseloides niger*	SP, ONHP List 2, CSSC	Suitable nesting habitat is limited to cliffs near water courses. Breeding sites are widely distributed in Oregon and California; none known in Klamath or northern Siskiyou Counties.	Not documented during PacifiCorp surveys. Documented along Klamath River near Orleans (CNDDB 2010).
Pilelated woodpecker	*Drycopus pileatus*	BLM, SV ONHP List 4	Occurs in all forest and woodland cover types with moderate to dense tree canopy closure. Requires large snags 25 inches or more in diameter for excavating suitable nest cavities.	Documented during PacifiCorp surveys along Keno reach, at J.C. Boyle Reservoir, along J.C. Boyle bypass and peaking reaches, and along Fall Creek.

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Acorn woodpecker	*Melanerpes formicivorus*	FSC, BLM, ONHP List 4	Nests in cavities in snags of deciduous tree species, particularly oak snags at least 17 inches in diameter.	Several nesting colonies documented during PacifiCorp surveys in oak, oak-juniper, and oak/conifer habitats, primarily at Copco Reservoir. Also documented during PacifiCorp surveys at J.C. Boyle and Iron Gate Reservoirs, along J.C. Boyle peaking reach, along Copco bypass reach, along Fall Creek, and along Klamath River from Iron Gate Dam to Shasta River.
Lewis' woodpecker	*Melanerpes lewis*	FSC, BLM, BCC, SC, ONHP List 2	Associated with oak woodlands and mixed oak conifer habitat, but also can be found in a variety of open forest stands including ponderosa pine and cottonwood-dominated riparian areas.	Documented during PacifiCorp surveys in upland habitats along J.C. Boyle peaking reach, in riparian habitats at Iron Gate Reservoir, and along Klamath River from Iron Gate Dam to Shasta River. Documented in Klamath River Canyon (ORBIC 2010).
White-headed woodpecker	*Picoides albolarvatus*	FSC, BLM, BCC, SC, ONHP List 2	Nests in cavities typically in ponderosa pine at least 18 inches in diameter. Occurs in lodgepole pine, ponderosa pine, and Klamath mixed conifer forests with trees greater than 11 inches in diameter.	Documented during PacifiCorp surveys along J.C. Boyle bypass reach. Not listed on CNDDB for project area (CNDDB 2010).
Williamson's sapsucker	*Sphyrapiicus thyroideus*	BLM, SU	Associated with higher-elevation coniferous forest types including ponderosa pine, lodgepole pine, and Douglas-fir.	Known to occur in the general project vicinity but not documented during PacifiCorp surveys.
Olive-sided flycatcher	*Contopus cooperi*	FSC, BLM, BCC, SV, ONHP List 4	Typically found in coniferous forests with tall trees providing suitable perch sites.	Documented during PacifiCorp surveys along Link River, at Keno, J.C. Boyle and Iron Gate Reservoirs, and along Keno and J.C. Boyle peaking reaches. Not listed on CNDDB for project area (CNDDB 2010).
Willow flycatcher	*Empidonax traillii*	FSC, BLM, BCC, SV, ONHP List 4, CE	Associated with dense riparian willow thickets.	Documented during PacifiCorp surveys in some of the more dense willow patches along Link River, at J.C. Boyle, Copco, and Iron Gate Reservoirs, along the J.C. Boyle peaking reach, and along Klamath River from Iron Gate Dam to Shasta River. Also documented at Iron Gate Reservoir at Jenny Creek (CNDDB 2010).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Black phoebe	*Sayornis nigricans*	BLM	Nests on cliffs or rock outcrops near water. Forage in riparian areas with thick vegetation and some nearby vertical surface. The Klamath study area exists along the northern limit of the species range.	Documented during PacifiCorp surveys along the Iron Gate-Shasta reach. Also regularly seen along the Miller Island section of the Keno Impoundment (R. Larson, USFWS).
Purple martin	*Progne subis*	FSC, BLM, SC, ONHP List 2, CSSC	Riparian and wetland forests, as well as Klamath mixed conifer forest, ponderosa pine forest, montane hardwood oak woodland, montane hardwood oak-conifer, and montane hardwood oak-juniper with sparse to moderate tree canopy closure (<60 percent). Range is patchy and may include portions of the study area.	Documented during PacifiCorp surveys above the upper falls at Fall Creek.
Black-capped chickadee	*Parus atricapillus*	CSSC	Nests in a variety of woodland habitats wherever suitable, small nest cavities can be found.	Documented during PacifiCorp surveys along Link River and at Copco and Iron Gate Reservoirs.
Pygmy nuthatch	*Sitta pygmea*	BLM, SV	Typically found in ponderosa pine forests with less than 70 percent canopy closure.	Documented during PacifiCorp surveys at Keno Impoundment and J.C. Boyle Reservoir.
Blue-gray gnatcatcher	*Polioptila caerulea*	BLM	Mixed chaparral, montane hardwood oak woodland, montane hardwood oak-juniper. Range overlaps the study area. The species is specifically known to breed in the chaparral of the Klamath basin.	Documented during PacifiCorp surveys at Iron Gate reservoir.
Western bluebird	*Sialia mexicana*	BLM, SV, ONHP List 4	Found in a variety of open habitats; may be limited by the availability of suitable nesting cavities. Nests in open clearings adjacent to woodlands or in human-made structures providing suitable nest sites.	Documented during PacifiCorp surveys along Copco bypass reach, along Fall Creek, and at Iron Gate Reservoir.

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Yellow warbler	*Dendroica petechia*	CSSC	Found in riparian deciduous forest, riparian shrub, scrub-shrub wetland, and forested wetland. Breeds in riparian habitat throughout North America and winters south from Mexico through South America.	Documented during PacifiCorp surveys throughout the project vicinity at all project reservoirs and in all project reaches. Not listed on CNDDB for project area (CNDDB 2010).
Yellow-breasted chat	*Icteria virens*	FSC, BLM, ONHP List 4, CSSC	Found in the brushy understory of deciduous and mixed woodlands; breeds in brushy vegetation, typically willow thickets, along rivers and streams.	Documented during PacifiCorp surveys primarily in wetland and riparian habitats along J.C. Boyle peaking reach, at Copco Reservoir, along Fall Creek, and along Klamath River from Iron Gate Dam to Shasta River. Not listed on CNDDB for project area (CNDDB 2010).
Mammals				
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*	FSC, BLM, SC, ONHP List 2, CSSC	Generally found in open forests and a variety of habitats; the availability of suitable roost sites (rock crevices, cliff ledges, and human-made structures) limits distribution and occurrence.	Known from J.C. Boyle peaking reach but not documented during PacifiCorp surveys. One occurrence in project area listed as sensitive by ORBIC (2010). Not listed on CNDDB for project area (CNDDB 2010).
Yuma myotis bat	*Myotis yumanensis*	FSC, BLM, ONHP List 4	Generally found in open forests and a variety of habitats; the availability of suitable roost sites (rock crevices, cliff ledges, and human-made structures) limits distribution and occurrence.	Documented during PacifiCorp surveys roosting in J.C. Boyle forebay spillway house, in transformer bays at Copco No. 1 powerhouse, and in rafters at Iron Gate south gatehouse. Also known from J.C. Boyle peaking reach. One occurrence outside project area (CNDDB 2010).
Western gray squirrel	*Sciurus griseus*	BLM, SU, ONHP List 4	Found in a variety of forested habitat types including mixed conifer forest, ponderosa pine forest, lodgepole pine, montane hardwood oak woodland, montane hardwood oak-conifer, and montane hardwood oak juniper with trees greater than 6 inches in diameter.	Documented during PacifiCorp surveys at J.C. Boyle and Copco Reservoirs, along J.C. Boyle peaking reach, and along Copco bypass reach.
Ringtail	*Bassariscus astutus*	BLM, SU, ONHP List 4	Uses a mixture of forest and shrublands or other habitats that provide vertical structure near rocky or riparian areas. Range overlaps the study area. The species is known to occur in the study area.	Not documented during PacifiCorp surveys. Documented in Klamath River Canyon (ORBIC 2010). Not listed on CNDDB for project area (CNDDB 2010).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Fisher	*Martes pennanti*	FC, BLM, SC, ONHP List 2, CSSC	Mature, closed canopy forests with some deciduous trees; intermediate to large tree stages of conifer forests and riparian deciduous forests both with high tree canopy closure. Habitats in the study area include lodgepole pine, Klamath mixed conifer forest, ponderosa pine forest, riparian deciduous forest, montane hardwood oak-conifer with trees >11 inches dbh. Range overlaps the study area.	Not documented during PacifiCorp surveys. Documented along lower Klamath River (CNDDB 2010). Has been documented in the Upper Klamath Basin within the last two years (T. Collom, ODFW, personal communication, April 29, 2011).
Plants				
Applegate's milk-vetch	*Astragalus applegatei*	FE, OE, ONHP List 1	Occurs in flat-lying, seasonally moist, strongly alkaline soils.	Documented during PacifiCorp surveys at Keno Impoundment. 450 plants were found in 2009 on the west side of the Keno Impoundment near the PacifiCorp wareyard and 10,000 plants occur in a number of sites near the west side of Keno Impoundment on Collins Products property (R. Larson, USFWS).
Greene's mariposa-lily	*Calochortus greenei*	FSC, BLM, OC, ONHP List 1, CNPS List 1B	Occurs primarily in annual grassland, wedgeleaf ceanothus chaparral, and oak and oak-juniper woodlands.	Documented during PacifiCorp surveys at Iron Gate Reservoir. Yellow starthistle, medusahead, and annual bromes form the dominant herb layer cover at nearly all of the sites where Greene's mariposa lily was observed. Also known to occur at Copco Reservoir and along J.C. Boyle peaking reach. Several occurrences on CNDDB along Klamath River (2010).
Bristly sedge	*Carex comosa*	ONHP List 2	Marshes, lake shores, and wet meadows.	Not documented during PacifiCorp surveys. Documented along east shore of J.C. Boyle Reservoir (ORBIC 2010).
Brown fox sedge	*Carex vulpinoidea*	CNPS List 2	Near water on moist open ground in swamps, prairie swales, lowland forests, wet ditches, ravines, and along the edges of marshes, springs, lakes, and ponds.	Not documented during PacifiCorp surveys. Documented on north shore of Iron Gate Reservoir, 0.1 mile downstream from mouth of Fall Creek (CNDDB 2010).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Mountain lady's slipper	*Cypripedium montanum*	BLM, S/M-D, ONHP List 4, CNPS List 4	Occurs in dry, open conifer forests, but more often in moist riparian habitats.	Documented during PacifiCorp surveys on a shaded and mesic, forested slope above Frain Creek, a small tributary to the Klamath River at Frain Ranch along J.C. Boyle peaking reach. Not listed on CNDDB for project area (CNDDB 2010).
Del Norte buckwheat	*Eriogonum nudum* var. *paralinum*	CNPS List 2	Coastal bluff scrub, coastal prairie.	Not documented during PacifiCorp surveys. Documented on sand bar at mouth of Klamath River (CNDDB 2010).
Bolander's sunflower	*Helianthus bolanderi*	BLM, ONHP List 3	Occurs in yellow pine forest, foothill oak woodland, chaparral, and occasionally in serpentine substrates or wet habitats.	Documented during PacifiCorp surveys in highly disturbed and degraded sites filled with annual bromes and starthistle along the lower reach of Hayden Creek, a tributary to the Klamath River along J.C. Boyle peaking reach, and south of Iron Gate Reservoir.
Salt heliotrope	*Heliotropium curvasassavicum*	BLM, ONHP List 2	Occurs in seasonally flooded, low-lying, non-porous areas on the east side of the Cascades.	Documented during PacifiCorp surveys at the upper end of Keno Impoundment.
Bellinger's meadow-foam	*Limnanthes floccosa ssp. bellingerana*	FSC, BLM, OC, ONHP List 1, CNPS List 1B	Occurs in rocky, seasonally wet meadows, or along the margins of damp rocky meadows often partially shaded by adjacent trees and shrubs.	Not documented during PacifiCorp surveys. Known to occur along J.C. Boyle peaking reach. Not listed on CNDDB for project area (CNDDB 2010).
Detling's silverpuffs	*Microseris laciniata* ssp. *detlingii*	CNPS List 2	Chaparral and grassy openings among Oregon white oak trees.	Not documented during PacifiCorp surveys. Documented west of Iron Gate Reservoir, 1.2 miles north of Klamath River bridge at Iron Gate Dam (CNDDB 2010).
Egg Lake monkeyflower	*Mimulus pygmaeus*	FSC, CNPS List 4	Occurs in damp areas or vernally moist conditions in meadows and open woods.	Documented during PacifiCorp surveys on the southwest end of J.C. Boyle Reservoir in damp mudflats adjacent to shallow and narrow tributaries to the Reservoir and under the transmission line just southwest of J.C. Boyle Dam. Not listed on CNDDB for project area (CNDDB 2010).
Wolf's evening-primrose	*Oenothera wolfii*	CNPS List 1B	Coastal bluff scrub, coastal dunes, coastal prairie, lower montane coniferous forest.	Not documented during PacifiCorp surveys. Documented along lower Klamath River (CNDDB 2010).

Table 3.5-4. Special-Status Species Known to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Occurrence in Project Area*
Red-root yampah	*Perideridia erythrorhiza*	FSC, BLM, OC, ONHP List 1	Occurs in moist prairies, pastureland, seasonally wet meadows, and oak or pine woodlands, often in dark wetland soils and clay depressions.	Not documented during PacifiCorp surveys. Known to occur along Keno reach, at J.C. Boyle Reservoir, and along J.C. Boyle peaking reach.
Columbia yellow cress	*Rorippa columbiae*	FSC, BLM, OC, ONHP List 1, CNPS List 1B	Occurs in cobbly, gravelly silt associated with seasonal creek drainages in ponderosa pine/juniper woodland, on the shores of alkaline lakes, along roadside ditches, in meadows, and seeps.	Documented during PacifiCorp surveys at Keno Impoundment. One occurrence at Klamath River near Orleans (CNDDB 2010).
Fleshy sage	*Salvia dorrii var. incana*	CNPS List 3	Occurs in silty to rocky soils in great basin scrub, pinyon, and juniper woodland.	Documented during PacifiCorp surveys on weathered bedrock outcrops overlain with thin, loose, and rocky substrate at Iron Gate Reservoir and along Klamath River from Iron Gate Dam to Shasta River. Not listed on CNDDB for project area (CNDDB 2010).
Pendulous bulrush	*Scirpus pendulus*	BLM, ONHP List 2, CNPS List 2	Occurs along streambanks and in wet meadows.	Documented during PacifiCorp surveys along Fall Creek and J.C. Boyle peaking reach. Documented outside project area (CNDDB 2010).
Short-podded thelypody	*Thelypodium brachycarpum*	FSC, BLM, ONHP List 2, CNPS List 4	Occurs in meadows and open flats.	Documented during PacifiCorp's field surveys in low-lying saltgrass grassland at Keno Impoundment. Large populations occur along both sides of the Keno Impoundment at Miller Island and on Collins Products property on the west side of Keno Impoundment (R. Larson, USFWS). Not listed on CNDDB for project area (CNDDB 2010).

Notes:
*Information on occurrence in the project area is based on PacifiCorp surveys (PacifiCorp 2004a) and information obtained from Oregon Biodiversity Information Center (ORBIC) and California Natural Diversity Database (CNDDB) databases (2010).
Key:
BCC: Birds of Conservation Concern (USFWS Division of Migratory Bird Management 2008a)
BLM: Bureau of Land Management sensitive species - species that could easily become endangered or extinct.

CDFG: California Department of Fish and Game
CE: California Endangered
CNPS List 1A: California Native Plant Society (CNPS)- Presumed extinct in California.
CNPS List 1B:rare, threatened, or endangered in California and elsewhere.
CNPS List 2: rare, threatened, or endangered in California, but more common elsewhere.
CNPS List 3: on the review list - more information needed
CNPS List 4: on the watch list - limited distribution
CSSC: California Department of Fish and Game Species of Special Concern - not listed under the federal or California Endangered Species Act but are believed to: 1) be declining at a rate that could result in listing, or 2) historically occurring in low numbers and having current known threats to their persistence
CT: California Threatened
FC: Federal Candidate Species
FD: Federal Delisted
FE: Federal Endangered
FP: Fully protected under the California Fish and Game Code
FSC: Federal Species of Concern
FT: Federal Threatened
OC: Candidate listing by Oregon Department of Agriculture (ODA) or Oregon Department of Fish and Wildlife (ODFW)
OE: Listed as endangered by ODA or ODFW
ONHP List 1: Oregon Natural Heritage Program (ONHP) threatened with extinction or presumed to be extinct throughout their entire range
ONHP List 2: threatened with extirpation or presumed to be extirpated from the state of Oregon
ONHP List 3: more information is needed before status can be determined, but may be threatened or endangered in Oregon or throughout their range
OHNP List 4: of conservation concern but not currently threatened or endangered
OT: Listed as threatened by ODA or ODFW
SC: Sensitive Critical - listed by ODFW as threatened or endangered is pending, or listing as threatened or endangered may be appropriate if immediate conservation actions are not taken.
SP: Sensitive Peripheral or Naturally Rare - listed by ODFW with populations on the edge of the range or historically low because of naturally occurring limiting factors
SU: Sensitive Undetermined Status - listed by ODFW for which status is unclear
SV: Sensitive Vulnerable - listed by ODFW as threatened or endangered is not imminent and can be avoided through continued or expanded use of adequate protective measures and monitoring. In some cases the populations are sustainable and protective measures
S/M-C: Survey and Manage Species, as designated in the Northwest Forest Plan; category C - Uncommon, pre-disturbance surveys practical
S/M-D: Survey and Manage Species, as designated in the Northwest Forest Plan; category D - Uncommon, pre-disturbance surveys not practical or necessary
USFWS: United States Fish and Wildlife Service

Reptiles

Four special-status reptile species were documented during PacifiCorp surveys: western pond turtle, northern sagebrush lizard, California mountain kingsnake, and common kingsnake. One additional species, sharptail snake, is known to occur based on previous studies (Table 3.5-4). Focused surveys for western pond turtle in 2002 resulted in 501 western pond turtle detections recorded during turtle surveys and 47 incidental observations in the study area, including 18 turtles in the beaver dam pond/wetland between Fall Creek and Iron Gate Reservoir, and 24 turtle observations along the Keno Impoundment shoreline during other wildlife surveys. A total of 276 turtles were documented in Keno Impoundment, 23 in J.C. Boyle Reservoir, 12 in Copco Reservoir, and 17 in Iron Gate Reservoir.

Several river reaches were also found to support pond turtles, including Fall Creek, the J.C. Boyle Peaking reach, and the Iron Gate-Shasta River reach. The turtle nesting habitat suitability mapping conducted in 2002 indicates that out of the 198 miles (319 km) of river and reservoir shoreline in the study area, approximately 42 miles (68 km) (21 percent) were characterized as having suitable nesting and basking habitat. An additional 60 miles (97 km) (30 percent) have suitable basking habitat structure (logs, large rocks, or patches of persistent emergent vegetation), but do not have the high quality potential nesting habitat either because of steep slopes, developed shorelines, or shorelines with dense understory vegetation (PacifiCorp 2004a).

Habitat for western pond turtle is affected by fluctuating water levels at reservoirs and along river reaches, particularly Iron Gate Reservoir and the J.C. Boyle peaking reach. Lower water levels can reduce the amount of aquatic habitat and make bordering emergent wetlands less accessible due to increased distance from water for hatchling turtles (PacifiCorp 2004a).

In addition, dense emergent vegetation may reduce turtle access to upland habitat, although typically small breaks are present. Developed areas and recreation sites may restrict shoreline habitat for turtles and affect their movement into nesting and overwintering sites. Turtles are known to be sensitive to human activity at distances of 328 feet; thus, human disturbance along roads, vegetation management, recreational activities, and other human activities are likely to affect turtles in the study area (PacifiCorp 2004a).

Northern sagebrush lizard was found during PacifiCorp surveys in or near forest habitat at locations including Iron Gate Reservoir, Keno Canyon reach, and J.C. Boyle peaking reach. California mountain kingsnake was recorded along Copco Road and along the J.C. Boyle canal near riparian woodlands. Common kingsnake was found on Copco Road, at the Iron Gate Reservoir, on a road in the Iron Gate-Shasta River reach, and near the Fall Creek reach within oak/woodland or chaparral habitat. No sharptail snakes were detected in the study area during 2002 surveys; however, the species was detected in the upper J.C. Boyle peaking reach during Bureau of Land Management (BLM) surveys in the spring of 2001 (PacifiCorp 2004a).

Birds

Birds represent the largest group of special-status species detected in the study area with 46 of the 69 species with potential to occur detected during PacifiCorp surveys or listed by ORBIC or CNDDB as occurring in the project area (Table 3.5-4). Among these, there are 14 water birds, 1 quail, 11 raptors, 3 owls, 2 swifts, and 15 passerines.

Most detections of special-status birds during PacifiCorp surveys were recorded in wetland, riparian, or aquatic habitat. During reservoir surveys, large numbers of American white pelicans were found on all reservoirs: 191 birds on Keno Impoundment, 71 birds on J.C. Boyle Reservoir, 55 birds on Copco Reservoir, and 107 birds on Iron Gate Reservoir. In addition, a great blue heron colony, which is afforded special protection by CDFG, was documented at Copco Reservoir during supplemental surveys in that area (PacifiCorp 2004b).

Bald eagles were also found at all reservoirs, with the highest number (12) found at Copco Reservoir (PacifiCorp 2004a). A known bald eagle nesting site is south of Copco Dam (USFWS 2007). Bald eagles also utilize the middle and lower Klamath River for foraging and nesting.

Golden eagles have historically nested on cliffs from J.C. Boyle bypass reach to Iron Gate Reservoir. During PacifiCorp surveys, golden eagles were found in several locations, including Copco and Iron Gate Reservoirs and J.C. Boyle powerhouse (PacifiCorp 2004a).

The only federally-listed bird species detected during PacifiCorp surveys was the northern spotted owl, a federal threatened species found near J.C. Boyle Reservoir and along J.C. Boyle peaking reach. A nest site is also known to occur near the Copco Reservoir. All known nest sites and suitable nesting or roosting habitat is more than one mile away from the dams and associated facilities (personal communication with L. Roberts, USFWS, June 27, 2011).

Critical habitat for northern spotted owl is located north of the Klamath Hydroelectric Project boundary in the Jenny Creek watershed, upstream of the Copco Reservoir, and along portions of the lower Klamath River. Northern spotted owls are also documented to occur on National Forest lands and along the Lower Klamath River on lands managed by Green Diamond Resources Company, and a Habitat Conservation Plan for the northern spotted owl is currently in development. Potentially suitable spotted owl habitat in the project area includes all forested communities and oak woodlands adjacent to mixed conifer stands with high canopy cover and large diameter trees (USFWS 2008b).

The marbled murrelet, a federal threatened bird species, is known to occur on National Forest lands along the coast as well as on lands managed by Green Diamond Resources Company. This species does not occur inland near the PacifiCorp dams and associated facilities.

Four fully protected bird species, bald eagle, golden eagle, American peregrine falcon, and greater sandhill crane, are known to occur in the project area. Bald and golden eagles

are discussed above. American peregrine falcons are known to occur along the river including the J.C. Boyle bypass reach. Greater sandhill cranes have been documented nesting at J.C. Boyle Reservoir.

Mammals

Two special-status mammals, western gray squirrel and Yuma myotis bat, were detected during PacifiCorp surveys (Table 3.5-4). Three other species, Townsend's western big-eared bat, ringtail, and Pacific fisher, have documented occurrences on ORBIC or CNDDB within the project area.

Yuma myotis was detected at the J.C. Boyle forebay spillway house, the Copco 1 powerhouse, and the Iron Gate south gatehouse (PacifiCorp 2004a). Although the presence of the seven other special-status bat species with potential to occur in the project area was not detected during bat roost surveys at PacifiCorp facilities, it is likely that one or more of these other special-status bat species occur in the roosting colonies (personal communication with G. Leppig, CDFG, October 27, 2010).

Terrestrial Invertebrates

PacifiCorp did not conduct surveys for terrestrial invertebrates; however, special-status invertebrate species may occur within the project area (personal communication with R. Larson, USFWS, March 13, 2011). One species that may occur based on known occurrences near the project area is the Siskiyou sideband (*Monadenia chaceana*). A petition for federal listing of this species is currently under review (USFWS 2011).

Plants

Ten special-status plant species were documented during PacifiCorp surveys. Of these, seven species are associated with wetland and/or riparian habitats. Seven additional species are known to occur in the project area based on previous investigations or occurrences listed on ORBIC or CNDDB (Table 3.5-4). Four of these additional species are associated with wetland and/or riparian habitats.

One federally-listed species, Applegate's milk-vetch, was detected at the Keno Impoundment during PacifiCorp surveys. Applegate's milk-vetch, a federal and Oregon endangered species, was found growing in an area of dense, undisturbed salt grass within 45 to 100 feet (17 to 30 m) of Keno Impoundment. The plant was observed along the reservoir in an area of approximately 250 feet (76 m) in length at a height or elevation above the reservoir water surface of less than 2 feet (0.6 m) (PacifiCorp 2004a). Additional surveys have identified Applegate's milk-vetch at several sites along the Keno Impoundment totaling over 10,000 plants. Three sites occur in areas within 100 meters of the Keno Impoundment in areas dominated by rabbitbrush (USFWS 2009).

Two other federal endangered plants potentially occur in the project area. These are Yreka phlox (*Phlox hirsuta*) and Gentner's fritillary (*Fritillaria gentneri*). Ultramafic soils upon which the phlox is found occur within two miles of Copco Reservoir. The habitat for the fritillary that consists of mixed hardwood-conifer vegetation dominated by Oregon oak is present in the reach along Copco and Iron Gate Reservoirs (personal communication with R. Larson, USFWS, March 13, 2011).

No rare or threatened natural communities were identified during the PacifiCorp study or documented on database searches by ORBIC or CNDDB.

3.5.3.5 Wildlife Corridors and Habitat Connectivity

Riparian corridors enable movement of both aquatic and terrestrial wildlife. Project reservoirs and waterways create substantial breaks in the connectivity of riparian habitat. Large mammals such as elk and deer are likely able to traverse these waterways, while they may create a barrier to movement by small mammals, reptiles, and amphibians. In addition, canals, roads, powerhouses, and other facilities often block movement of amphibians and reptiles (PacifiCorp 2004a).

Birds are highly mobile; however, the presence of transmission power lines has the potential to cause bird mortality from collisions, particularly when transmission lines cross flight paths that birds use during seasonal migration or daily movements between foraging and roosting areas. PacifiCorp determined that there are four segments of project transmission lines near areas of high waterfowl and wading bird use: one at Link River, one near the upstream end of Iron Gate Reservoir, and two segments of line that cross Iron Gate Reservoir. However, because these lines do not pass between the reservoirs/rivers and major wetlands or cropland that would attract foraging birds, the probability of collision is reduced, and there has been no evidence of avian collisions occurring on PacifiCorp lines (PacifiCorp 2004a).

3.5.4 Environmental Consequences

3.5.4.1 Effects Determination Methods

Evaluating potential impacts on terrestrial resources first entailed identification of the affected terrestrial resources within the analysis area. These include existing terrestrial vegetation communities and their value as habitat for wildlife; terrestrial special-status wildlife and plant species; use and dependence of terrestrial species on riparian, wetland, and aquatic reservoir habitat; and terrestrial wildlife corridors.

Habitats that are most likely to be most affected by the project alternatives are the riparian zones, wetlands, and aquatic habitats. Upland habitats would also be affected by KBRA actions. These habitats are important to many terrestrial wildlife species by providing food, water, cover, and breeding sites. Riparian and wetland communities have been greatly reduced in size within the Klamath Basin, with a wetland loses up to 90 percent by some estimations (Larson and Brush 2010). Thus, such habitats within the project area very important to the many species they support. Special-status species are vulnerable to any habitat loss or degradation. The ability to move to other habitat through wildlife corridors is vital to many terrestrial species. Modification of existing terrestrial habitat in the project area, especially limited riparian and wetland habitat, would have the potential to cause adverse effects.

The evaluation of the project alternatives considered short-term construction effects as well as permanent effects on terrestrial resources. Outputs of sediment transport and

hydrologic models were used to identify predicted modifications of terrestrial vegetation communities and how that would affect wildlife habitat, including riparian areas, wetlands, and at reservoirs.

3.5.4.2 Significance Criteria

For the purposes of this EIS/EIR, impacts would be significant if they would result in the following:

- A substantial adverse effect, either directly or through habitat modifications, on any special-status terrestrial species identified in local or regional plans, policies, or regulations, or by the CDFG, USFWS, BLM, or USFWS;
- A substantial adverse effect on any riparian habitat;
- A substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act through direct removal, filling, hydrological interruption, or other means;
- A substantial adverse effect on species considered significant to Indian Tribes;
- A substantial interference with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors; or
- A substantial adverse effect on natural communities through the introduction or spread of invasive plants.

3.5.4.3 Effects Determinations

Alternative 1: No Action/No Project

Under the No Action/No Project Alternative, the Four Facilities would remain in place. There would be no change to current sedimentation or scour rates in downstream river reaches.

As no construction would occur, there would be no impacts related to temporary loss of riparian habitat or direct mortality or disturbance of wildlife. No long-term habitat loss or gain would occur under the No Action/No Project Alternative. Existing habitat provided by the reservoirs would remain, which would benefit many species of birds, including waterfowl and bald eagles, bats, and other wildlife and plants that are supported by the aquatic habitat the reservoirs provide.

Populations of special-status plant and animal species, locally rare populations, and rare or threatened natural communities would continue to be influenced by various stressors in the Klamath Basin, including habitat degradation from surrounding land uses and invasive species. There would be no substantial changes to these stressors under the No Action/No Project Alternative. Under the No Action/No Project Alternative, existing wildlife corridors would remain. The reservoirs and other facilities would continue to present a barrier to movement of some terrestrial wildlife species.

The KBRA would not be implemented under the No Action/No Project Alternative; however, some Ongoing Restoration Actions would occur, including the Agency Lake and Barnes Ranches project which would breach existing dikes to convert the current

63,770 acre feet of pumped storage to passive storage in Upper Klamath Lake. This would provide benefits to waterfowl and their habitat in Upper Klamath Lake NWR through the re-establishment of a natural system of passive water storage. However, since the KBRA would not be fully implemented under the No Action/No Project Alternative, there would continue to be uncertainty regarding water deliveries to the NWRs, and subsequent impacts on terrestrial resources within the Lower Klamath NWR, Tule Lake NWR, and Upper Klamath NWR. Specifically, there would be continued impacts on wetland habitat, waterfowl, and nongame waterbirds that utilize the NWRs based on predicted water deliveries without implementation of the KBRA.

Adverse impacts on terrestrial resources under the No Action/No Project Alternative would be associated with the continuance of various stressors within the area of analysis, including habitat degradation, invasive species, barriers to movement of some terrestrial wildlife species, and uncertainties in water deliveries to the NWRs. **There would be no change from existing conditions for these threats under the No Action/No Project Alternative.**

Alternative 2: Full Facilities Removal of Four Dams (Proposed Action)

The Proposed Action would include the complete removal of power generation facilities, bypass canals, pipelines, unnecessary transmission lines, dams, and dam foundations associated with the Four Facilities. The Proposed Action also includes implementation of the KBRA.

To facilitate dam removal, PacifiCorp reservoirs would be drawn down. Accumulated sediment behind the dams would be flushed downstream with river flows, particularly natural seasonal high flows, during dam removal. The drawdown of the reservoirs and dam demolition would begin in November 2019. It is assumed that blasting would be required to remove each of the dams. Blasting would occur between January and July 2020 and would be conducted twice a day (early morning and late afternoon) for up to six days per week during the dam removal period. As described in Section 3.23, Noise and Vibration, blasting would introduce noise levels up to a maximum of 94 A-weighted decibels (dBA) at a distance of 50 feet, while maximum levels for typical construction equipment would range from 75 dBA (pickup truck) to 90 dBA (mounted impact hammer/hoe ram) at 50 feet.

Drawdown of all reservoirs would occur at a rate that would minimize riverbank erosion, while maintaining regulatory discharge rates from the reservoirs (Greimann et al 2010). This rate would be adjusted depending on the water year, such that flow rates downstream of the dams would not increase significantly above regulatory rates.

Following drawdown of the reservoirs, existing upland vegetation is expected to remain unchanged and contribute to successional processes on newly exposed areas. Wetland-dependent vegetation currently along the margins of the reservoirs is expected to die out and transition to upland communities. Wetland species that occur near confluences may remain unchanged if the hydrology is unaltered, and could expand down to the river channel at reconnected tributaries. Passive restoration of wetland vegetation in areas

along the restored river channel is considered feasible, since relatively high densities of viable wetland vegetation seed are present in reservoir sediments based on seedbank analysis (DOI 2011a).

In contrast, active restoration would be needed for upland and riparian areas. In accordance with the Reservoir Area Management Plan (DOI 2011), the reservoir areas will be re-seeded with various herbaceous species (primarily grasses) following drawdown in the spring. Seeding is expected to occur via aerial application of hydromulch, as access to newly drawn down reservoir areas would be limited. Hydroseeding would occur prior to full drawdown, likely in stages as areas are exposed, and ultimately covering the entire area of exposed sediment following drawdown. It would be necessary to hydroseed before the reservoir sediment desiccates so that there is residual soil moisture for seed germination. Following hydroseeding, grasses would quickly germinate and grow on the exposed reservoir surfaces to stabilize the surface of the sediment, minimizing erosion. Invasive plant species would be controlled with the use of herbicides such as glyphosate that have low soil mobility and low toxicity to fish and aquatic organisms (DOI 2011a).

Riparian restoration activities would include planting of various woody species along the channel margins to stabilize the river banks and provide habitat for fish and other species. Pole plantings would be installed in the riparian/wetland zone once the reservoirs have been completely drawn down, the new river channel is established, and banks are stabilized so that labor crews can access riparian zones. Pole planting would occur in the spring the year after drawdown, ideal timing for establishment of woody species in riparian zones (DOI 2011a).

Following reservoir drawdown and prior to restoration activities, additional fencing may be necessary at the reservoir sites to keep livestock out and protect restoration areas, including Parcel B lands. If needed, any new fencing would be "wildlife-friendly" to enable elk and deer to jump over without getting entangled in barbed wire. The amount and location of additional fencing would be determined once the Definite Plan is available.

In addition to restoration of reservoir areas, many of the developed recreation sites around the reservoirs would be removed and restored following dam removal. This would include regrading, seeding, and planting of parking lots (DOI 2011a).

Due to the likelihood for invasive or weedy species to colonize newly exposed areas, and the known presence and proximity of large stands of upland invasive species near the reservoir shorelines, active control measures would be required to ensure native species are established. A Habitat Restoration Plan and construction specifications would be developed once the Definite Plan is available and would be submitted to the resource agencies for review and approval as part of required permit application packages prior to construction.

The Habitat Restoration Plan would include details for the installation of native plants and hydroseeding in appropriate areas to re-vegetate all areas disturbed during construction, including reservoir areas, demolition and disposal sites, staging, access and haul roads, and turn-arounds. Long-term maintenance and monitoring to control invasive species would be included. Performance standards to be met to ensure successful re-vegetation of disturbed areas will be developed as described in **Mitigation Measure *TER-1*** in Section 3.5.4.4.

In addition, to minimize the introduction of invasive plant species into construction areas, construction vehicles and equipment would be cleaned with compressed water or air within a designated containment area to remove pathogens, invasive plant seeds, or plant parts and dispose of them in an appropriate disposal facility.

Construction Impacts on Wetland and Riparian Vegetation Communities

Construction of the Proposed Action could result in the loss of wetland and riparian vegetation communities. Disturbances associated with construction areas and haul roads where clearing, grading, and staging of equipment would occur would have impacts on sensitive habitats, including wetlands and riparian habitats along reservoirs and river reaches. Culturally important species such as willows occur in these riparian areas. Heavy machinery traversing wetland and riparian areas could change local topography and destroy wetland and riparian vegetation, and could introduce hazardous materials that would adversely affect water quality in wetland and riparian areas.

Once the Definite Plan is prepared and construction areas are delineated, measures would be implemented prior and during construction to avoid and mitigate impacts to sensitive vegetation communities such as wetlands. During construction for the Proposed Action, wetlands within 50 feet of any ground disturbance and construction-related activities (including staging and access roads) would be clearly marked and/or fenced to avoid impacts from construction equipment and vehicles. If new temporary access roads are required, grading would be conducted such that existing hydrology would be maintained. In addition, best management practices (BMPs) would be implemented to address potential water quality impacts on wetlands. These construction BMPs are discussed further in Section 3.2, Water Quality. The following pollution and erosion control measures would be incorporated into the Proposed Action to prevent pollution caused by construction operations and to reduce contaminated stormwater runoff:

- Oil-absorbing floating booms would be kept onsite and the contractor would respond immediately to aquatic spills during construction.
- Vehicles and equipment would be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they would be cleaned up immediately. Equipment maintenance and/or repair would be confined to one location at each project construction site. Runoff in this area would be controlled to prevent contamination of soils and water.
- Dust control measures would be implemented, including wetting disturbed soils.
- A stormwater pollution prevention plan would be implemented to control the release of stormwater from construction areas. The plan would also prevent construction

materials (fuels, oils, and lubricants) from spilling or otherwise entering waterways or water bodies.

Incorporation of these elements into the Proposed Action would avoid or reduce temporary impacts on wetland and riparian vegetation communities including culturally important species that occur there to less than significant.

Construction Impacts on Wildlife

Construction activities could result in direct mortality or harm to special-status amphibian and reptile species during construction. Construction would require heavy machinery to move through construction areas, staging areas, and haul roads where special-status amphibian and reptile species could occur. Contact with construction vehicles could result in direct mortality or injury to special-status amphibian and reptile species including western toad, western pond turtle, California mountain kingsnake, and common kingsnake.

To avoid or reduce the potential for mortality and disturbance of special-status species within construction areas for the Proposed Action, the following elements would be incorporated:

- Biological Resources Awareness Training. Before any ground-disturbing work (including vegetation clearing and grading) occurs in the construction area, a qualified biologist would conduct a mandatory biological resources awareness training for all construction personnel and the construction foreman. This training would inform the crews about special-status species that could occur on site. The training would consist of a brief discussion of the biology and life history of the special-status species; how to identify each species, including all life stages; the habitat requirements of these species; their status; measures being taken for the protection of these species and their habitats; and actions to be taken if a species is found within the project area during construction activities. Identification cards would be issued to shift supervisors; these cards would have photos, descriptions, and actions to be taken upon sighting of special-status species during construction. Upon completion of the training, all employees would sign an acknowledgment form stating that they attended the training and understand all protection measures. An updated training would be given to new personnel and in the event that a change in special-status species occurs.
- Protocol-level Wildlife Surveys. Prior to construction, a biologist approved by the resource agencies (USFWS, ODFW, and/or CDFG) would conduct protocol surveys to ensure no special-status animals are present within the area in which any construction activity would occur. If special-status species are present (except for birds), they would be captured and relocated to a suitable area in consultation with the resource agencies.

- Exclusion Measures for Special-Status Wildlife. Construction areas, including staging areas and access routes, would be fenced with orange plastic snow fencing to demarcate work areas. The approved biologist would confirm the location of the

fenced area prior to habitat clearing, and the fencing would be maintained throughout the construction period. Additional exclusion fencing or other appropriate measures would be implemented in consultation with the resource agencies to prevent use of construction areas by special-status species during construction.

- To prevent entrapment of wildlife that do enter construction areas during activities, all excavated, steep-walled holes or trenches in excess of 2 feet deep would be inspected by a biologist or construction personnel approved by the resource agencies at the start and end of each working day. If no animals are present during the evening inspection, plywood or similar materials would be used to immediately cover the trench, or it would be provided with one or more escape ramps set at no greater than 1,000 foot intervals and constructed of earth fill or wooden planks. Trenches and pipes would be inspected for entrapped wildlife each morning prior to onset of activity. Before such holes or trenches are filled, they would be thoroughly inspected for entrapped animals. Any animals so discovered would be allowed to escape voluntarily, without harassment, before activities resume, or removed from the trench or hole by a qualified biologist approved by the resource agencies and the animals would be allowed to escape unimpeded. A biologist approved by the resource agencies would be responsible for overseeing compliance with protective measures during clearing and construction activities within designated areas throughout the construction activities.

- General Requirements for Construction Personnel include the following:
  - The contractor would clearly delineate the construction limits and prohibit any construction-related traffic outside these boundaries.
  - Construction crews would be required to maintain a 20 miles per hour (mph) speed limit on all unpaved roads to reduce the chance of wildlife being harmed if struck by construction equipment.
  - All food-related trash items such as wrappers, cans, bottles, and food scraps generated during construction, subsequent facility operation, or permitted operations and maintenance activities of existing facilities would be disposed of in closed containers only and removed at least once a week from the site. The identified sites for trash collection would be fenced to minimize access from wildlife.
  - No deliberate feeding of wildlife would be allowed.
  - No pets would be allowed on the project site.
  - No firearms would be allowed on the project site.
  - If vehicle or equipment maintenance is necessary, it would be performed in the designated staging areas.
  - Any worker who inadvertently injures or kills a federally or state listed species, bald eagle, or golden eagle, or finds one dead, injured, or entrapped would immediately report the incident to the construction foreman or biological monitor. The construction foreman or monitor would notify the resource agencies within 24 hours of the incident.

These elements of the Proposed Action would avoid or reduce mortality and harm to special-status amphibian and reptile species during construction.

In addition to direct mortality and harm, the initial release of sediment from behind the dams could result in impacts on western pond turtle if it causes turtles to move away from underwater refugia and thus become more vulnerable to predators. Increased sediment following dam removal is anticipated to be a short-term effect immediately following dam removal. Western pond turtles utilize deep pools and low velocity areas with underwater refugia to hide from predators. Increased sediment may actually benefit turtles by providing substrate turtles burrow into for cover (Reese and Welsh 1998). Other important habitat features, such as availability of basking sites, are not anticipated to be adversely affected by the release of sediment. In the long term, sediment released during dam removal would be flushed out of downstream reached during subsequent high flow events. Dam removal is anticipated to result in benefits to western pond turtle by restoring a more natural flow regimes that increases slow-flowing pool habitat near the river banks and habitat heterogeneity overall (Reese and Welsh 1998). Therefore, there would be no adverse effects on western pond turtle from short-term sedimentation following dam removal. **Therefore, impacts on special-status amphibian and reptile species during construction would be less than significant.**

Construction activities could result in adverse impacts on birds, including special-status bird species, during construction. Potential impacts on migratory birds, including several special-status species, could occur through nest abandonment due to noise and human activity during construction periods.

It is anticipated that dam demolition activities (including blasting) would begin in January 2020 and mobilization of construction equipment would begin in the late fall of 2019. Construction activities that could result in noise and disturbance impacts on birds would include dam demolition, clearing of access and haul roads, upload staging and disposal sites, and restoration activities. While it would not be possible to exclude all birds from these construction areas throughout the construction period, the Proposed Action incorporates specific construction measures to avoid or reduce impacts on birds, as described below.

It is important to note that analysis of effects to northern spotted owl and other federally-listed species that could be affected by the Proposed Action will be evaluated in a Biological Assessment (BA) under Section 7 of the federal Endangered Species Act. Avoidance measures and project design standards will be detailed in the description of the Proposed Action in the BA.

<u>Northern Spotted Owl</u>
The Proposed Action incorporates specific elements that would avoid or reduce impacts on northern spotted owls. The northern spotted owl typically nests from February through September in the project area. Suitable northern spotted owl nesting and roosting habitat does not occur within one mile of the dams, and none is expected to grow by 2019 (personal communication with L. Roberts, USFWS, June 27, 2011). In addition, since

mobilization of construction equipment would begin in November 2019, noise and human presence would likely discourage northern spotted owls from initiating nesting near construction areas. Therefore, impacts on this species from the Proposed Action would be limited to disturbance during aerial hydroseeding that would occur during restoration activities. All landings, staging areas and flight paths would avoid suitable northern spotted owl nesting or roosting habitat by 0.25 mile.

In addition, prior to construction, a biologist approved by the resource agencies (USFWS, ODFW, and/or CDFG) would conduct protocol surveys endorsed by USFWS for northern spotted owls in all areas supporting suitable habitat that may be affected by construction, including along access roads and haul routes. If, during preconstruction surveys, an active nest of northern spotted owl is identified, a restriction buffer would be established in consultation with the resource agencies to ensure nests are not disturbed from construction. This would include evaluation of noise levels at the nesting site.

Bald Eagle

Bald eagles are protected under the Bald and Golden Eagle Protection Act and are fully protected under California law. The Proposed Action incorporates specific elements that would avoid or reduce impacts on bald eagles[1]. Bald eagle nesting trees are known to exist within or near to construction areas for the Proposed Action, and bald eagles often use the same nests in multiple years. Prior to construction, all necessary permits in compliance with the Bald and Golden Eagle Protection Act would be obtained. Measures incorporated into the Proposed Action to reduce impacts on bald eagles (and golden eagles) from loss of nesting habitat will include the following:

- Complete a two-year survey for eagle use patterns prior to construction activities. Surveys will be conducted by a qualified avian biologist and will include any facilities to be removed or modified to determine bird use patterns. Surveys will be conducted during the time of year most likely to detect eagle usage.

- Prior to construction, conduct at least one focused survey for bald eagle nests within 2 miles of construction areas, including along access roads and haul routes, during the early bald eagle breeding season (January 15 through February 28). Three additional surveys would be conducted; two between March 1 and April 1, and one after April 1. Additional survey visits would be conducted to determine if eagles are nesting within 2 miles of the construction area. Before commencing construction activities during the early breeding season, at least one survey would be conducted within two weeks prior to beginning operations.

- Wherever possible, clearing, cutting, and grubbing activities shall be conducted outside the eagle breeding period (January 15 through August 15);

[1] The discussion presented in this section includes both BMPs that would be incorporated during construction as well as mitigation measures in order to facilitate the development of compliance documentation for the Bald and Golden Eagle Protection Act. These BMPs are also described in Appendix B.

- If active nests are present within 2 miles of construction areas, a 0.5-mile restriction buffer would be established in consultation with the resource agencies to ensure nests are not disturbed. If active bald eagle nests are present within 0.5 miles of construction areas, construction activities would be halted until approval is obtained from the resource agencies to resume. If a nest is not within line of site of the project, meaning that trees or topographic features physically block the eagle's view of construction activities, the buffer could be reduced to 0.25 miles

Golden Eagle

Golden eagles are protected under the Bald and Golden Eagle Protection Act and are fully protected under California law. The Proposed Action incorporates specific elements that would avoid impacts on golden eagles[2]. Golden eagles are known to have historically nested in cliffs within the project area. Golden eagles are also known to nest within pine, juniper and oak trees.

Measures incorporated into the Proposed Action to reduce impacts on golden eagles from loss of nesting habitat will include the following:

- Complete a two-year survey for eagle use patterns prior to construction activities. Surveys will be conducted by a qualified avian biologist and will include any facilities to be removed or modified to determine bird use patterns. Surveys will be conducted during the time of year most likely to detect eagle usage.

- Prior to construction, at least one protocol survey for golden eagle nests would be conducted within 5 miles of construction areas, including along access roads and haul routes, during the breeding season (January through July). Before commencing construction activities during the early breeding season, at least one focused survey would be conducted within two weeks prior to beginning operations. Additional survey visits would be conducted to determine if eagles are nesting within 2 miles of the construction area.

- Wherever possible, clearing, cutting, and grubbing activities shall be conducted outside the eagle breeding period (January through July).

- If active nests are present within 2 miles of construction areas, a 1-mile restriction buffer would be established in consultation with the resource agencies to ensure nests are not disturbed. If active golden eagle nests are present within 1 mile of construction areas, construction activities would be halted until approval is obtained from the resource agencies to resume. If an active nest is not within line of site of the project, meaning that trees or topographic features physically block the eagle's view of construction activities, the buffer could be reduced to 0.5 miles.

[2] Please note that the discussion presented in this section includes both BMPs that would be incorporated during construction as well as mitigation measures in order to facilitate compliance with the Bald and Golden Eagle Protection Act. These BMPs are repeated in Appendix B.

It is noted that USFWS is not currently issuing permits authorizing take for golden eagles under the Bald and Golden Eagle Protection Act.

Osprey

The Proposed Action incorporates specific elements that would avoid or reduce impacts on ospreys. Known osprey nests are located within or near to construction areas for the Proposed Action. Some osprey nests are located on transmission line poles or other man-made platforms that would be removed during construction for the Proposed Action, or are located within areas where construction noise or human presence would cause disturbance to the birds. To avoid nesting disturbance, the nests located within or near to construction areas would be removed prior to the breeding season and replaced with nesting platforms following construction on a 1:1 basis. In addition, a search for osprey nests within 0.25 mile of construction areas, including along access roads and haul routes, would be conducted prior to beginning operations and during the breeding season, which begins in February. If active nests are present, a 0.75-mile restriction buffer would be established and delineated on maps and resource agencies would be consulted to obtain concurrence prior to conducting construction activities.

Willow Flycatcher

The Proposed Action incorporates specific elements that would avoid or reduce impacts on willow flycatcher. Prior to construction during the nesting season of June 1-August 31, a focused survey for willow flycatcher would be conducted within construction areas, including along access roads and haul routes. The survey would follow the established protocol described in Bombay et al (2003). If active willow flycatcher nests are detected, a 0.5-mile restriction buffer would be established and delineated on maps and resource agencies would be consulted to obtain concurrence prior to conducting construction activities.

Peregrine Falcon

Peregrine falcons, a fully protected species, are known to occur along the J.C. Boyle bypass reach, and have the potential to occur elsewhere in the project area. Specific elements described below (see Other Migratory Birds) would be incorporated during construction, including nesting surveys, to avoid or reduce impacts on peregrine falcons. If nesting peregrine falcons are detected, a restriction buffer would be established prior to conducting construction activities.

Greater Sandhill Crane

Greater sandhill cranes, a fully protected species, are known to occur in the project area, and have been documented nesting along the J.C. Boyle Reservoir. Specific elements described below (see Other Migratory Birds) would be incorporated during construction, including nesting surveys, to avoid or reduce impacts on greater sandhill cranes. If nesting sandhill cranes are detected, a restriction buffer would be established prior to conducting construction activities.

Other Migratory Birds

The Proposed Action incorporates the following specific elements that would avoid or reduce impacts on migratory birds from removal, destruction, or disturbance of active nests during construction:

- Removal or trimming of any trees or other vegetation for construction would be conducted outside of the nesting season (March 20 through August 20). This would include removal or trimming of trees along access roads and haul routes and within disposal sites.

- Where clearing, trimming, and grubbing work cannot occur outside the migratory bird nesting season, a qualified avian biologist will survey construction areas to determine if any migratory birds are present and nesting in those areas.

- For all raptors (other than eagles), inactive nests will be removed before nesting seasons begin, to the greatest extent practicable. For those nests where access is difficult, traffic cones or other deterrents will be placed in the nest platform to prevent nesting in the year of construction. All deterrents will be removed as soon as possible after construction crews have passed to a point beyond the disturbance buffer for that species. See **Mitigation Measure *TER-2*** (Section 3.5.4.4, Table 3.5-5).

- If an active nest is located, a restriction buffer in accordance with **Mitigation Measure *TER-2*** (Section 3.5.4.4, Table 3.5-5) would be established and the resource agencies would be consulted to obtain concurrence prior to conducting construction activities.

Incorporation of these elements into the Proposed Action and implementation of **Mitigation Measures *TER-2*** and ***TER-3*** would avoid or reduce impacts on birds during construction[3]. **Therefore, impacts on birds, including special-status bird species, during construction would be less than significant.**

Construction Impacts on Plants

Construction activities could result in the loss of special-status plants during construction. Special-status plants occurring in construction areas could be destroyed by heavy equipment. Prior to the implementation of construction activities, a botanist approved by the resource agencies would conduct protocol-level surveys within construction areas for special-status plants during the peak blooming season prior to start

[3] The discussion presented in this section includes both BMPs that would be incorporated during construction as well as mitigation measures in order to facilitate the development of compliance documentation for the Bald and Golden Eagle Protection Act. These BMPs are also described in Appendix B.

of construction. If any special-status plants occur within the construction areas, locations of these plants would be clearly marked and/or fenced to avoid impacts from construction equipment and vehicles where possible.

In addition, to avoid or reduce impacts on special-status plants from the introduction of invasive plant species, construction vehicles and equipment would be cleaned with compressed water or air within a designated containment area to remove pathogens, invasive plant seeds, or plant parts and dispose of them in an appropriate disposal facility. The Habitat Restoration Plan would include details for the installation of native plants to re-vegetate all areas disturbed during construction. Long-term maintenance and monitoring to control invasive species would be included.

It is important to note that analysis of effects to Applegate's milk-vetch (*Astragalus applegatei*) and other federally-listed plant species that could be affected by the Proposed Action are evaluated in a BA under Section 7 of the federal Endangered Species Act. Determination of impact significance for federally-listed plant species in this EIS/EIR is consistent with the findings of the BA.

Following any positive Secretarial Determination and during development of the Definite Plan, additional measures would be included as needed for "Survey and Manage" species to comply with the requirements of the applicable Land and Resource Management Plan for any activities on National Forest System lands.

Incorporation of these elements into the Proposed Action and implementation of **Mitigation Measures *TER-1*** and ***TER-4*** would avoid or reduce impacts on special-status plants during construction[4]. **Therefore, impacts on special-status plants during construction would be less than significant.**

Construction activities could result in adverse impacts on wildlife from riparian habitat loss. Impacts from temporary loss of riparian habitat would affect wildlife that use this habitat, particularly several common amphibian species, such as Pacific giant salamander and several bird species, including several species of special-status riparian birds such as willow flycatcher, yellow warbler, and yellow-breasted chat. In addition, western pond turtle, a special-status reptile, could be affected by the loss of this habitat. As discussed below, there would be gains in riparian habitat at the reservoirs following dam removal and restoration. In addition, localized disturbance of riparian habitat downstream due to sedimentation is expected to be short-term, with colonization of riparian plant seedlings and subsequent re-vegetation of riparian areas within three years following implementation of the Proposed Action. **Therefore, impacts on wildlife using riparian habitat would not be significant.**

Long-Term Habitat Loss and/or Modification

[4] The discussion presented in this section includes both BMPs that would be incorporated during construction as well as mitigation measures in order to facilitate the development of compliance documentation for the Bald and Golden Eagle Protection Act. These BMPs are also described in Appendix B.

Permanent alteration of existing habitats would have long-term impacts on plants and animals that occur in these habitats, including special-status plants and wildlife species.

Loss of Aquatic Habitat at Reservoirs

Removal of reservoirs could result in impacts on wildlife from the permanent loss of aquatic habitat. Following dam removal, aquatic habitat at reservoirs would become riverine, riparian, and upland habitat depending on future hydrologic and physical (topographic) conditions. Water birds that use the reservoirs seasonally during migration and/or for overwintering would be affected by the loss of this aquatic habitat for nesting, foraging, loafing, and roosting. The loss of aquatic habitat would also reduce foraging opportunities for fish-eating birds including osprey, merganser, cormorant, egret, and heron. Changes in food availability for birds such as dabbling ducks that consume aquatic vegetation and invertebrates would occur. However, these species would utilize the river or other aquatic habitat outside the project area for foraging once the reservoirs are gone. Similarly, foraging habitat for swifts and bats would be reduced; however, swifts and bats would also feed in riverine habitat once the reservoirs are gone.

The loss of aquatic habitat at reservoirs would reduce habitat for western pond turtle. However, turtles would utilize future restored riverine habitat at the former reservoir areas as they do currently along the J.C. Boyle peaking reach, Iron Gate-Shasta River reach, and other areas. There are at least five known bald eagle nests near Copco and J.C. Boyle Reservoirs, and additional nest locations are located between these two areas and upstream (personal communication with R. Larson, USFWS, March 13, 2011). Since bald eagles primarily use the Lower Klamath NWR for preying on waterfowl, there would be some anticipated effects on bald eagles from loss of this reservoir habitat. However, bald eagles would utilize riverine habitat or other aquatic habitat outside the project area for foraging.

PacifiCorp estimated that decommissioning and removal of the Four Facilities would result in the loss of a total of about 2,404 reservoir acres (FERC 2007). Compared to the large reservoirs and wetland complexes of Upper Klamath Lake (approximately 77,000 acres), Tule Lake (approximately 13,000 acres), and Lower Klamath Lake (approximately 22,000 acres of which approximately 2,200 acres are permanently flooded), the project reservoirs represent a small amount of the available reservoir habitat in the Klamath Basin when wetland and aquatic habitat at the NWRs is at full capacity. Based on National Wetland Inventory data, there are approximately 380,000 acres of wetlands in the Oregon portion of the upper Klamath Basin (Larson and Brush 2010).

It is also important to note that under the Proposed Action, much of the aquatic reservoir habitat would be converted to upland and riparian habitat based on future hydrology and with active restoration activities (hydroseeding and planting) described above (DOI 2011a). Upland vegetation restoration would occur at a total of approximately 1,602 acres following reservoir drawdown: 195 acres at J.C. Boyle Reservoir, 632 acres at Copco 1 Reservoir, and 775 acres at Iron Gate Reservoir. Restoration of wetland/riparian habitat would occur at a total of 272 acres following reservoir drawdown: 52 acres at

J.C. Boyle Reservoir, 170 acres at Copco 1 Reservoir, and 50 acres at Iron Gate Reservoir (DOI 2011a).

At Copco 1 and Iron Gate Reservoirs there is approximately 1,400 acres of upland habitat types that are currently inundated by the reservoirs. These habitat types include grassland, juniper, oak woodland, mixed chaparral, pasture, orchard and agriculture (PacifiCorp 2004a). Removing the dams, specifically removal of Iron Gate and Copco 1 Reservoirs, would increase the amount of available acres of habitat within critical deer winter range in the long term, benefitting deer by expanding winter range habitat (personal communication with J. Hamilton, USFWS, January 7, 2011).

In addition, based on historic maps and aerial photos, PacifiCorp (2004a) estimated historic aquatic habitat types at the reservoirs to be approximately 125 acres at J.C. Boyle Reservoir, 119 acres at Copco 1 Reservoir, and 108 acres at Iron Gate Reservoir (Copco 2 Reservoir was not mapped). Thus, a total of approximately 350 acres of aquatic habitat occurred historically and would be expected to be available for restoration following reservoir drawdown.

Therefore, while unavoidable impacts on wildlife, particularly waterfowl and other waterbirds, from the permanent loss of reservoir habitat would occur under the Proposed Action, these impacts would be less than significant.

Modification of Riparian Habitat

Dam removal could result in long-term impacts on riparian habitat from sedimentation in downstream reaches. After the dams are removed and if sediment is allowed to flush downstream, the steep riverbank slopes along the reservoirs would cause the new river channel to conform to the pre-dam river channel alignment (Gathard Engineering Consultants [GEC] 2006). Riverbank stabilization and re-vegetation of riverbank with native plantings would be conducted at each reservoir after the drawdown is complete. This restoration would occur in areas with slopes less than 20 percent, and would entail transplanting and pole-planting of trees and woody shrubs with interspersed seeding of herbaceous species. In addition to erosion control, restoration would exclude invasive plant species from colonizing un-vegetated areas exposed by reservoir drawdown.

Thus, riparian habitat at reservoirs would increase with restoration following drawdown. PacifiCorp estimated that decommissioning and removal of the Four Facilities would add about 184 acres of riparian vegetation. This estimate was based on the assumption of an average riparian corridor width of 100 feet along the 3.6-mile length of the J.C. Boyle Reservoir, the 4.5-mile length of the Copco Reservoir, the 0.3-mile length of the Copco 2 Reservoir, and the 6.8-mile length of the Iron Gate Reservoir (FERC 2007).

The establishment of woody species along the riparian corridor is expected to take several years, following which there would be benefits to terrestrial wildlife, particularly riparian-associated species. With control and monitoring of invasive plants, there would also be benefits to native plant species.

In downstream reaches of the Klamath River, no adverse erosion of riverbanks would be anticipated based on expected flow rates. However, based on modeling conducted using the DREAM-1 modeling software to simulate downstream sediment deposition following dam removal, sedimentation would be likely to occur, particularly if the number of intense storms or snowmelt were low during the 2019-2020 season and in subsequent years. This sedimentation would be limited to downstream reaches as far as Cottonwood Creek. If rain and snowmelt levels were high, less sedimentation in downstream reaches would occur, as there would be more water in the system to flush out sediment (Stillwater Sciences 2008).

Sediment sampling in the reservoirs has indicated that the majority of accumulated sediment is fine-grained (coarse sand and finer) (DOI 2010). If the sediment is allowed to move downstream naturally, it is likely that some sedimentation would occur in deep pools or channel margins downstream during low-flow periods and cover wetland/riparian with a veneer of fine material (DOI 2011b). This short term wetland/riparian habitat alteration would be localized and would not be substantial. Additionally, this sediment would be flushed out during subsequent high flow events (see Section 3.11 Geology, Soils and Geologic Hazards). Sedimentation has the potential to create new surfaces for riparian plants to colonize, and result in beneficial effects on riparian habitat (Shafroth et al. 2002). Effects on existing riparian habitat from sedimentation would be short-term in nature, as riparian vegetation would quickly be re-established through colonization by seedlings of willows, cottonwoods, and other riparian species. This colonization occurs following disturbance during peak flows that creates substrate for seedlings, followed by declining spring and summer flows that occur during seed dispersal. Under this natural process, new riparian vegetation would become established within 3-5 years after disturbance (Riparian Habitat Joint Venture 2009). Based on this assessment, no permanent loss of riparian habitat is anticipated to occur in any river reaches. There would be gains in riparian habitat (approximately 184 acres) at the reservoirs through restoration efforts following dam removal and reservoir drawdown. **Both short- and long-term impacts on riparian habitat would be less than significant.**

Long-term Impacts on Wetlands

Dam removal could result in loss of reservoir wetlands. A substantial amount of the historical wetlands of the Upper Klamath Basin have been lost to agricultural developments and water diversions (Larson and Brush 2010). As a result, there is less wetland habitat for waterfowl than there was prior to development, but abundant food for dabbling ducks and geese that feed on small grains in fields surrounding the wetlands (Jarvis 2002). Under the Proposed Action, there would be unavoidable impacts on wetland habitat at the J.C. Boyle, Copco 1, Copco 2, and Iron Gate Reservoirs (245 acres, Table 3.5-2). However, wetlands would be expected to become reestablished in some areas along the new river channel with adequate hydrology, soils, and vegetation. As these areas would be prone to colonization by invasive plant species, management and control of invasives would be needed.

Impacts on wetlands under the Proposed Action would be a significant impact because of the historical loss of wetlands and the regulatory framework of laws and regulations for wetland protection. **Mitigation Measure *TER-5* would reduce this impact on wetlands to less than significant.** See Section 3.5.4.4.

Long-term Impacts on Wildlife Habitat from Tree and Vegetation Removal

The Proposed Action would result in long-term impacts on wildlife habitat from tree and vegetation removal. During construction, some trees and other vegetation that provides habitat for birds and other wildlife would be removed at construction areas, upland disposal sites, equipment staging areas, and access and haul roads. Following construction, restoration of this habitat would be conducted through the planting of native vegetation in accordance with a Habitat Restoration Plan approved by the resource agencies. In addition, if known nesting trees or platforms used by osprey or other raptors (except eagles) are removed, they would be replaced on a 1:1 basis as part of the Proposed Action. No known nesting sites for bald or golden eagles or northern spotted owl would be removed under the Proposed Action. **Therefore, long-term impacts on wildlife habitat from tree and vegetation removal would be less than significant.**

It is important to note that analysis of effects to northern spotted owl and other federally-listed species that could be affected by the Proposed Action are evaluated in a BA under Section 7 of the federal Endangered Species Act. Determination of impact significance for the northern spotted owl and other federally-listed species in this EIS/EIR is consistent with the findings of the Biological Assessment.

Long-term Impacts on Bats from Loss of Roosting Habitat

The Proposed Action would result in long-term impacts on bats from loss of roosting habitat. Impacts on bats would occur from the loss of dam structures and associated facilities used as roosting habitat. Based on surveys conducted by PacifiCorp in 2003, bats roost in all four dams or in their associated facilities and structures (FERC 2007). Multi-species colonies of bats, which have been documented using these structures, are likely to contain one or more special-status bat species, and regardless of listing status, the loss of a bat colony site or adverse effects to an active colony would be a significant impact. **Mitigation Measure *TER-6* would reduce impacts on bats to less than significant.** See Section 3.5.4.4.

Long-term Impacts on Amphibian Habitat

Dam removal could result in long-term impacts on amphibians from habitat degradation due to sedimentation in downstream reaches of the Klamath River. Sediment inputs in downstream reaches could fill riffle substrate in some areas, reducing localized habitat for the larval phases of amphibian species such as Pacific giant salamander. However, most sediment is expected to be flushed out during subsequent high flow events (Stillwater 2008), and restoring a more natural sediment regime would be expected to benefit amphibian habitat in the long-term. In addition, removal of reservoirs would reduce populations of non-native bullfrogs which prey on native amphibians. **Therefore, long-term impacts on amphibian habitat would be less than significant.**

Long-term Impacts on Special-Status Species at the Reservoirs

The Proposed Action could result in impacts on special-status species from loss of aquatic habitat at reservoirs. Permanent loss of wetland and aquatic habitat at reservoirs would adversely affect special-status species populations that use these habitats. Specifically, western toad and western pond turtle have been documented at the four reservoirs in the project area, and over 25 species of special-status birds use aquatic and wetland habitat and the reservoirs.

Bald Eagles at the Reservoirs

Loss of aquatic habitat following reservoir drawdown would result in impacts on bald eagles that nest at the reservoirs. These eagles could use riverine habitat once the reservoirs are gone, or move to other aquatic habitat such as the large reservoirs of the NWRs. **Therefore, long-term impacts on bald eagles would be less than significant.**

Great Blue Heron Colony at Copco Reservoir

Under the Proposed Action the drawdown and conversion of reservoirs to riverine habitat may adversely affect a great blue heron colony documented at the Copco Reservoir. This colony would use riverine habitat once the reservoirs are gone, or move to other aquatic habitat nearby. **Therefore, long-term impacts on great blue heron would be less than significant.**

Special-Status Plants at the Reservoirs

Wetland habitat at reservoir margins supports several species of special-status plants (Table 3.5-4). Many of these plants, including Applegate's milk-vetch, short-podded thelypodium, Columbia yellow cress, and salt heliotrope, occur at only the Keno Impoundment which would not be drawn down under the Proposed Action. However, there is potential for special-status plants to occur at the reservoirs that would be drawn down, and therefore there would be loss of habitat for these species once the reservoirs are removed. Protocol-level surveys for special-status species would be conducted prior to construction to determine the location of special-status plants. If found, **Mitigation Measure *TER-4*** (Section 3.5.4.4) would be implemented to reduce impacts. **Therefore, long-term impacts on special-status plants would be less than significant.**

Impacts on Culturally Important Species

The Proposed Action could result in impacts on culturally important species. Willows, which are riparian-dependent plants, are culturally important to Indian Tribes who use them for basket-making. As discussed above, riparian habitat is expected to increase in the long-term at the reservoirs, and any loss of riparian habitat from sedimentation downstream of the dams is anticipated to be short-term in nature. Since willows are one of the first species to re-colonize following disturbance (Riparian Habitat Joint Venture 2009), impacts on these culturally important plants are not anticipated to be significant. No effects on other culturally important plants are anticipated. **Therefore, impacts on culturally important species would be less than significant.**

Effects on Wildlife Corridors

The Proposed Action would result in impacts on wildlife corridors. The Proposed Action would be expected to provide beneficial effects on terrestrial wildlife movement. Removal of PacifiCorp structures and open water reservoirs and restoration of the pre-dam river channel would eliminate areas of wide deep water crossings that are a hindrance to large and small mammal movements from one side of the river to the other. More narrow and shallower water crossing points would be available for both large and small terrestrial species to cross the river. This would provide benefits in increasing the amount of habitat available for these species, making them less vulnerable to disease and other environmental stressors than before dam removal. Increased movement could also increase genetic diversity in previously separate populations. **Therefore, the Proposed Action would result in beneficial effects on wildlife corridors.**

Effects Related to Invasive Plant Species

The Proposed Action could result in native vegetation impacts related to invasive plants. Under the Proposed Action, there would be potential for invasive plant species to quickly re-colonize exposed reservoir bottoms and other disturbed soil areas and out-complete native plants. In addition, invasive plant seeds could be transported to downstream areas following removal of the dams, particularly those plants that disperse by water (Nilsson et al 2010, Merritt & Wohl 2002, Meritt et al. 2010, Merritt & Wohl 2002). A Reservoir Area Management Plan (DOI 2011a) would be implemented for restoration of native plants and habitat communities at the reservoirs. In addition, the Habitat Restoration Plan would be implemented for restoration of native habitats at upland areas disturbed by construction, including disposal sites, access and haul roads, and equipment staging areas. Other specific elements of construction include measures to prevent the introduction of invasive plant species. All construction vehicles and equipment would be cleaned with compressed water or air within a designated containment area to remove pathogens, invasive plant seeds, or plant parts and dispose of them in an appropriate disposal facility. Implementation of the Reservoir Area Management Plan and the Habitat Restoration Plan would include long-term maintenance and monitoring to control invasive species. See **Mitigation Measure *TER-1*** in Section 3.5.4.4.

It is noted that reed canarygrass, which is found along the margins of some of the reservoirs and in many riparian areas along the Klamath River, is an invasive plant that can colonize quickly and out-compete native plants. After draw down of the reservoirs, it is likely that populations of reed canarygrass along the reservoir margins would die (personal communication with R. Larson, USFWS, March 13, 2011).

In addition, seasonal high flows under the Proposed Action would contribute to improving the quality of riparian habitat in the J.C. Boyle bypass reach by decreasing the prevalence of reed canarygrass (Administrative Law Judge 2006).

Implementation measures during construction and restoration following construction in accordance with **Mitigation Measure *TER-1*** (Section 3.5.4.4) would avoid or reduce impacts related to invasive plants. **Therefore, impacts related to invasive plants would be less than significant.**

Installation of the Yreka Water Supply Pipeline

The Proposed Action would require the Yreka water supply pipeline to be relocated, which could result in construction impacts on terrestrial resources. The existing water supply pipeline for the City of Yreka passes under the Iron Gate Reservoir and would have to be relocated prior to the decommissioning of the reservoir to prevent damage from deconstruction activities or increased water velocities once the reservoir has been drawn down. The pipeline would either be suspended from a pipe bridge across the river near its current location, or rerouted along the underside of the Lakeview Road Bridge below Iron Gate Dam. Surveys are still required to determine if the bridge is adequate to support the pipeline and the construction traffic from the decommissioning activities. A detailed discussion of the traffic impacts and road conditions concerns is provided in Section 3.22, Traffic and Transportation, and Mitigation Measure TR-1 addresses these concerns. Construction of a pipe bridge in the existing location or placing the pipeline along an existing road and bridge would have temporary construction impacts on terrestrial resources within construction areas. Elements incorporated into construction and implementation of **Mitigation Measures *TER-1*** through ***TER-4*** (Section 3.5.4.4), as necessary, would avoid or reduce these impacts. Habitat restoration in accordance with **Mitigation Measure *TER-1*** (Section 3.5.4.4) would reduce long-term impacts in construction areas to less than significant. **Therefore, impacts on terrestrial resources would be less than significant.**

Replacement of the Iron Gate Fish Hatchery Water Supply Pipeline

Under the Proposed Action, the Iron Gate Fish Hatchery would remain in place, but the water supply pipeline from the penstock intake structure to the fish hatchery would be removed with the dam. Under the KHSA, PacifiCorp is responsible for evaluating hatchery production options that do not rely on the current Iron Gate Hatchery water supply. PacifiCorp is also responsible for proposing and implementing a post-Iron Gate Dam Hatchery Mitigation Plan (Hatchery Plan) to provide continued hatchery production for eight years after the removal of Iron Gate Dam; and this Hatchery Plan would be developed with information from PacifiCorp's evaluation. However, PacifiCorp is not required to propose a Hatchery Plan until six months following an affirmative Secretarial Determination. The Lead Agencies do not currently know what PacifiCorp will propose in the Hatchery Plan and are unlikely to know unless there is an affirmative Secretarial Determination. An impact analysis of a hatchery production option that does not rely on the current Iron Gate water supply would be purely speculative at this point. Therefore, the potential environmental effects of implementing a hatchery production option that does not rely on the current Iron Gate water supply are not analyzed in this EIS/EIR.

Relocation of Recreation Facilities

The Proposed Action would require the relocation of existing recreation facilities, which would require the construction of new facilities along the river bank. Recreation facilities, such as campgrounds and boat ramps, currently located on the reservoir banks would be relocated down slope to be near the new river bed once the reservoir is removed. Impacts specific to the relocation of the Recreation Facilities are discussed in Section 3.20, Recreation. Temporary construction impacts on terrestrial resources could occur at the existing recreation facility sites from contact between wildlife and equipment

and habitat disturbance. Elements incorporated into construction would avoid or reduce these effects, and **Mitigation Measures *TER-1*** through ***TER-4*** (Section 3.5.4.4) would be implemented, as necessary, to avoid or reduce impacts. The relocation would occur on lands that are currently inundated and provide no existing habitat to terrestrial species, and would not impede habitat restoration efforts. **Therefore, impacts on terrestrial resources would be less than significant.**

Keno Transfer

Implementation of the Keno Transfer could cause impacts to terrestrial resources. The Proposed Action includes the Keno Transfer, a transfer of title for the Keno Facility from PacifiCorp to the DOI. This transfer would not result in the generation of new impacts on terrestrial resources compared with existing facility operations. Following transfer of title, DOI would operate Keno in compliance with applicable laws and would provide water levels upstream of Keno Dam for diversion and canal maintenance consistent with agreements and historic practice (KHSA Section7.5.4). **Therefore, implementation of the Keno Transfer would result in no change from existing conditions.**

East and West Side Facility Decommissioning

Decommissioning the East and West Side Facilities could cause adverse effects to terrestrial resources. Decommissioning of the East and West Side canals and hydropower facilities of the Link River Dam by PacifiCorp as a part of the KHSA will redirect water flows currently diverted at Link River Dam into the two canals, back in to Link River. The decommissioning action would not be expected to result in the disturbance of any currently undisturbed habitat. **Therefore, implementation of the East and West Side Facility Decommissioning action would result in no change from existing conditions.**

KBRA

Implementation of programs under the KBRA would increase the amount of water in the Klamath River and maintain the elevation of Upper Klamath Lake. Water allocations and delivery obligations would also be established for the Lower Klamath NWR and Tule Lake NWR. During implementation of KBRA actions described below, special-status species and their habitats would be protected through coordination with resource agencies for compliance with the Endangered Species Act and development of habitat conservation plans by non-federal parties.

The KBRA has several programs that could result in impacts on terrestrial resources, including:

- Phases I and 2 Fisheries Restoration Plan
- Fish Entrainment Reduction
- Wood River Wetland Restoration
- Water Diversion Limitations
- On-Project Plan
- Water Use Retirement Program (WURP)
- Interim Flow and Lake Level Programs

- Mazama Forest Project

Fisheries Restoration Plan- Phase I and Phase II

Construction activities associated with the Fisheries Restoration Plan- Phase I and Phase II could result in impacts on terrestrial wildlife and/or habitat. The Fisheries Restoration Plan would include measures to restore riparian and floodplain vegetation throughout the Klamath Basin. Actions that could have impacts on terrestrial resources within the project area are described below.

Floodplain Rehabilitation

Floodplain rehabilitation may include activities such as riparian planting and understory thinning to facilitate the development of mature riparian stands. During construction, there could be adverse effects on terrestrial species, including special-status amphibians and reptiles, from direct contact with construction equipment and loss of habitat. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The timing of and specific locations where these floodplain rehabilitation actions could be undertaken is not certain but it assumed that some of these actions could occur at the same time and in the vicinity of the hydroelectric facility removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant. In the long term, terrestrial species that utilize riparian habitat are expected to benefit from floodplain rehabilitation and associated improvements to riparian habitat.**

Wetland and Aquatic Habitat Restoration

These activities may involve hydroseeding for creation of grass banks. During construction, there could be adverse effects on terrestrial species, including special-status amphibians and reptiles, from direct contact with construction equipment and loss of habitat. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The timing of and specific locations where these habitat restoration actions could be undertaken is not certain but it assumed that some of these actions could occur at the same time and in the vicinity of the hydroelectric facility removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant.**

Woody Debris Placement

These activities may involve the use of construction equipment to place large wood in the stream channel or along banks. During construction, there could be adverse effects on terrestrial species, including special-status amphibians and reptiles, from direct contact

with construction equipment and loss of habitat. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The timing of and specific locations where these woody debris placement activities could be undertaken is not certain but it assumed that some of these actions could occur at the same time and in the vicinity of the hydroelectric facility removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant.**

Fish Passage Correction

These activities may include culvert upgrades or replacements. During construction, there could be adverse effects on terrestrial species, including special-status amphibians and reptiles, from direct contact with construction equipment and loss of habitat. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The timing of and specific locations where these fish passage correction actions could be undertaken is not certain but it assumed that some of these actions could occur at the same time and in the vicinity of the hydroelectric facility removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant.**

Cattle Exclusion Fencing

This would entail the construction of fencing along riparian areas. During construction, there could be adverse effects on terrestrial species, including special-status amphibians and reptiles, from direct contact with construction equipment and loss of habitat. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The timing of and specific locations where these cattle exclusion fencing installation actions could be undertaken is not certain but it assumed that some of these actions could occur at the same time and in the vicinity of the hydroelectric facility removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant. In the long term, terrestrial species that utilize riparian habitat are expected to benefit from the establishment of riparian vegetation.**

Mechanical Thinning and Prescribed Burning

The structure and species composition of many forested stands have been altered through fire exclusion and past and on-going timber management. This includes mixed conifer

forests, oak woodlands, and aspen. The alteration of these stands has resulted in the degradation of habitat for species associated with these vegetative communities. Additionally, many of these stands exhibit high amounts of surface and ladder fuels, increasing the potential for uncharacteristically severe wildfire. The following best management practices can reduce the effects on plants and wildlife related to vegetation management:

- Small diameter thinning of overstocked upland forests to promote development of structurally diverse stands with desired species composition and variable densities, and to reduce the risk of uncharacteristically severe wildfire.

- Prescribed burning in upland forested habitats to promote the development of understory growth and reduce the amount of small to medium diameter surface fuels.

- In oak stands, small diameter thinning (typically < 9" dbh) of dense oaks to promote the development of large structurally diverse oak trees.

- Removal of encroaching juniper (up to 15" dbh).

- Installing fencing around aspen stands to exclude livestock and allow for the passive restoration of aspen trees combined with planting of native shrubs.

These activities are anticipated to result in benefits to terrestrial wildlife from restoration of upland habitats. However, there could be adverse effects on terrestrial species, including special-status amphibians and reptiles, from direct contact with construction equipment. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The timing of and specific locations where these mechanical thinning and prescribed burning actions could be undertaken is not certain but it assumed that some of these actions could occur at the same time and in the vicinity of the hydroelectric facility removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant.**

Road Decommissioning

Construction activities associated with road decommissioning could result in adverse effects on terrestrial species, including special-status amphibians and reptiles, from direct contact with construction equipment and loss of habitat. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The timing of and specific locations where these road decommissioning actions could be undertaken is not certain but it assumed that some of these actions could occur at the same time and in the vicinity of the hydroelectric facility

removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant.**

Gravel Augmentation
Placement of gravel in the stream using backhoes could result in adverse effects on terrestrial species, including special status amphibians and reptiles, from direct contact with construction equipment and loss of habitat. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The timing of and specific locations where these gravel augmentation actions could be undertaken is not certain but it assumed that some of these actions could occur at the same time and in the vicinity of the hydroelectric facility removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant.**

Each of the actions under the Phase I Fisheries Restoration Plan would require separate project-level evaluations under National Environmental Policy Act (NEPA) and Federal Endangered Species Act (ESA), as appropriate.

Fish Entrainment Reduction

Construction activities associated with Fish Entrainment Reduction could result in impacts on terrestrial wildlife and/or habitat. Fish Entrainment Reduction would entail the installation of fish screens at various water diversion structures for the Klamath Reclamation Project. There could be adverse impacts on riparian vegetation and wildlife habitat within these localized construction areas. During construction, there could be adverse effects on terrestrial species, including special-status amphibians and reptiles, from direct contact with construction equipment and loss of habitat. There could be impacts on special-status bird species such as bald and golden eagle and northern spotted owl from disturbance during nesting. There could also be impacts on special-status plants if they occur in construction areas. The geographic location and timing of fish screen installation reduces the potential for any negative terrestrial resource effects generated by this action from contributing to the effects of the hydroelectric facility removal actions analyzed above. Implementation of construction-related BMPs would occur during fish screen construction to avoid or reduce these impacts. **However, impacts would be potentially significant. Implementation of Mitigation Measures *TER- 1* through *TER- 4* would reduce these impacts to less than significant. Impacts on terrestrial resources from specific construction activities would be further analyzed as a part of future environmental compliance, as appropriate.**

Wood River Wetland Restoration

Modification of aquatic habitat from the Wood River Wetland Restoration project could result in impacts on terrestrial wildlife and/or habitat. Implementation of this project

may reconnect subsided wetlands adjacent to Agency Lake to provide additional water storage. Therefore, this project is anticipated to benefit waterfowl, water birds, and other species that utilize wetlands and aquatic habitat through increased reliability of water to wetland habitat. The geographic location and timing of this project reduce the potential for any negative terrestrial resource effects generated by this action from contributing to the effects of the hydroelectric facility removal actions analyzed above. However, some adverse effects could also occur to some species, depending on whether habitats are managed as marsh or open water. **Impacts on terrestrial wildlife and/or habitat would be less than significant.**

Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level Program

The Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level Programs could result in impacts on terrestrial wildlife and/or habitat. In general, additional water supply would be expected to increase the numbers of waterfowl using the National Wildlife Refuges.

Using the Water Resource Integrated Modeling System (WRIMS), the USFWS (2010) conducted an analysis of the effects of the Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level Programs on three NWRs (Lower Klamath NWR, Tule Lake NWR, and Upper Klamath NWR). The following paragraphs provide a summary of the findings of that analysis.

Lower Klamath NWR

Impacts on Water Delivery Needed to Support Wetland Habitat

Lower Klamath NWR water demand was modeled using WRIMS to estimate quantities of water delivered to the refuge under both the No Action/No Project Alternative and the Proposed Action Alternative through both the Ady Canal and D-Plant (USFWS 2010). For each time step in the model, the total refuge demand was approximated based on the area of habitat and the water requirement for that habitat. Modeling results indicate water delivery to Lower Klamath NWR would be greater if KBRA was implemented than under the No Action/No Project Alternative. By estimating the amount of water needed per wetland habitat type, USFWS (2010) determined that the Refuge would support more wetland habitat if KBRA was implemented than under the No Action/No Project Alternative.

D-Plant pumping is critical to serving the needs of some marsh units at Lower Klamath NWR that cannot be reached from the Ady Canal. Due to recent increases in pumping costs coupled with shortages of agricultural water, D-Plant pumping, especially in the irrigation season, has been declining over time and water from D-Plant often does not arrive at Lower Klamath NWR in a timely manner and in the quantities needed (USFWS 2010). Implementation of the KBRA would allow Lower Klamath NWR water allocation to be delivered through either the D-Plant or the Ady Canal or a combination of both at the times and quantities needed for optimal management of wetland habitats (USFWS 2010).

In addition, there would be less uncertainty regarding water rights if the KBRA was implemented as compared to the No Action/No Project Alternative. Implementation of the KBRA would result in a higher potential for the NWRs to receive more water than under the No Action/No Project Alternative (USFWS 2010).

Impacts on Waterfowl

To determine impacts on migratory waterfowl, the fall carrying capacity for waterfowl on Lower Klamath NWR was approximated based on the assumption that food resources are the major component influencing waterfowl use of the refuge during the peak September and October migratory period. Estimates of food energy produced per acre in each wetland habitat type, the daily energy requirement per bird, the period of use, and the estimated acres flooded was used to determine the carrying capacity of the wetland for foraging dabbling and diving ducks. Results indicate that if the KBRA was implemented, Lower Klamath NWR would support a higher number of fall migratory dabbling and diving ducks, in addition to benefitting molting mallards, than under the No Action/No Project Alternative (USFWS 2010; Yarris et al 1994).

Impacts on Nongame Waterbirds

An estimate of the numbers of nongame waterbirds (broadly defined as shorebirds, gulls, terns, cranes, rails, herons, grebes, egrets, and ibis) that would be supported with implementation of the KBRA was also conducted based on the approximate number of waterbirds that could be supported in late summer on the Refuge in different water year types. Using this method, the Refuge would support higher numbers of nongame waterbirds if the KBRA was implemented than the No Action/No Project Alternative. Furthermore, because wintering bald eagles in the Klamath Basin forage predominantly on waterfowl, the KBRA would result in higher numbers of wintering bald eagles than the No Action/No Project Alternative (USFWS 2010).

Impacts on Habitat Management

If the KBRA was implemented, lease land farming would continue, and 20 percent of the net lease revenues would be available to the Refuge for habitat enhancement. In contrast, under the No Action/No Project Alternative, all lease revenues would continue to be under the jurisdiction of Reclamation, some of which may or may not be available for habitat enhancement work on the Refuge (USFWS 2010).

Implementation of the Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level Programs as part of the KBRA would result in beneficial effects on wetland habitat, waterfowl, nongame waterbirds, and habitat management at Lower Klamath NWR. The geographic location of Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level Programs reduce the potential for any terrestrial resource effects generated by this action from contributing to the effects of the hydroelectric facility removal actions analyzed above. **Therefore, there would be beneficial effects on terrestrial resources from implementation of KBRA at Lower Klamath NWR.**

Tule Lake NWR

Impacts on Water Delivery Needed to Support Wetland Habitat
Water for wetland habitats in Sumps 1(A) and 1(B) of the Tule Lake NWR are primarily provided as return flows from private lands. With implementation of the KBRA, water for refuge wetlands and agricultural habitats would be derived from the agricultural allocation and shortages are expected to occur relatively infrequently as compared to the No Action/No Project Alternative, under which water shortages are expected in greater than 20 percent of years. Thus, KBRA implementation would result in more wetland habitat than the No Action/No Project Alternative (USFWS 2010).

Impacts on Waterfowl
Waterfowl use of the refuge currently depends upon wetland habitats provided in Sumps 1(A) and 1(B) and the "Walking Wetlands" program, which incorporates wetlands into commercial crop rotations, and food provided from Refuge agricultural lands (USFWS 2010). If the KBRA was implemented, there would be less uncertainty in agricultural water deliveries to Refuge wetlands and agricultural lands than under No Action/No Project. There would also be more certainty in water for the "Walking Wetlands" program that provides wetland-related food and habitats for migratory dabbling ducks and geese. Therefore, if KBRA were implemented there would be more wetland habitat and food resources for migratory waterfowl (USFWS 2010). In contrast to the Upper Klamath, due to the change in the water regime with the KBRA, there would be a benefit to molting mallards (Yarris et al 1994).

Impacts on Nongame Waterbirds
Nongame waterbirds are dependent on wetland habitats on Tule Lake NWR, which are dependent on agricultural return flows. Increased certainty of agricultural water deliveries with implementation of the KBRA would therefore have a beneficial effect on wetland habitats and the nongame waterbirds that depend on them than the No Action/No Project Alternative (USFWS 2010).

Impacts on Habitat Management
With implementation of the KBRA, there would be less uncertainty in the ability to manage Sump 1(B) than under No Acton/No Project. In addition, 20 percent of the net lease revenues to the Refuge would be available for habitat enhancement with KBRA implementation (USFWS 2010).

Implementation of the Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level Programs as part of the KBRA would result in beneficial effects on wetland habitat, waterfowl, nongame waterbirds, and habitat management at Tule Lake NWR. The geographic location of Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level Programs reduce the potential for any terrestrial resource effects generated by this action from contributing to the effects of the hydroelectric facility removal actions analyzed above. **Therefore, there would be beneficial effects on terrestrial resources from implementation of KBRA at Tule Lake NWR.**

Upper Klamath NWR

Impacts on Wetland Habitat from Water Delivery

Based on modeled water elevations for future years, water elevations in Upper Klamath Lake would be low enough to leave refuge wetlands dry during the fall migration period (September-October) in 82 percent of years with implementation of the KBRA as compared to 68 percent of years under the No Action/No Project Alternative (USFWS 2010). Thus implementation of the KBRA would actually be an adverse impact compared to the No Action/No Project Alternative, if no other measures are taken.

Impacts on Waterfowl

Male and female mallards molt at slightly different times of the year and mallards of both sexes depend on wetlands to escape predators during molting. Male mallards begin the molt in mid July with females initiating the molt approximately 30 days later. During the 30 day molting period, mallards (and other waterfowl species) lose all wing feathers and are incapable of flight. Dry conditions can have an adverse effect on the survival of individuals. Based on modeled Upper Klamath Lake elevations, under the KBRA Alternative water is present in refuge wetlands in all but 3 percent of future years in July and 38 percent of future years in August. Under the No Action Alternative/No Project Alternative, refuge wetlands become dry more often in July (20 percent of years), and August (59 percent of years). Thus, implementation of the KBRA would have a beneficial effect on molting male mallards in July and August compared to conditions under the No Action/No Project Alternative.

For female mallards, the effect is somewhat reversed, since refuge wetlands would be dry in a higher proportion of years in September with KBRA implementation (82 percent of years) compared to the No Action/No Project Alternative (68 percent of years). It is important to note that breeding mallards are monogamous and females (due to lower survival rates) form a smaller proportion of the population. Thus, the welfare of female mallards is more important to the viability of the species and this represents an adverse impact of KBRA implementation compared to the No Action/No Project Alternative (USFWS 2010). In addition, due to the large concentration of diving ducks and marine ducks in fall and winter, there may also be concern for effects of the KBRA on diving ducks and marine ducks in the fall and winter.

Impacts on Nongame Waterbirds

With KBRA implementation, water elevations in Upper Klamath Lake would be sufficient to support breeding nongame waterbirds in a higher number of future years than under the No Action/No Project Alternative. The primary breeding period for nongame waterbirds extends from March through July. For successful breeding, refuge wetlands must remain flooded during this time period. With KBRA implementation, water would be present in Refuge wetlands during more of this period than without KBRA implementation (USFWS 2010).

Implementation of the Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level Programs as part of the KBRA would result in beneficial effects on nongame waterbirds at Upper Klamath NWR. The geographic location of Water Diversion Limitations, On-Project Plan, WURP, and Interim Flow and Lake Level

Programs reduce the potential for any negative terrestrial resource effects generated by this action from contributing to the effects of the hydroelectric facility removal actions analyzed above. **While there is potential for adverse impacts on wetland habitat and some waterfowl, there would beneficial effects on other waterfowl and nongame waterbirds as compared to the No Action/No Project Alternative. Combined, these impacts would be less than significant.**

Juniper Removal under WURP

The WURP program could include juniper removal in order to increase inflow to Upper Klamath Lake. There could be adverse impacts on terrestrial wildlife, including nesting migratory birds, from removal of juniper trees. The geographic location and timing of these juniper removal actions reduce the potential for any negative terrestrial resource effects generated by this action from contributing to the effects of the hydroelectric facility removal actions analyzed above. Measures implemented during construction as described for the Proposed Action would avoid or reduce this impact; however, this impact would be potentially significant. **Implementation of Mitigation Measure *TER-2* would reduce this impact to less than significant.**

In the long-term, WURP is anticipated to result in long-term benefits to terrestrial wildlife, particularly waterfowl and waterbirds that utilize Upper Klamath Lake.

Mazama Forest Project

The Mazama Forest Project could result in adverse impacts on terrestrial resources. The Mazama Forest Project would transfer 90,000 acres of privately owned timberland back to the Klamath Tribes. With ownership of the lands, the tribe could hunt, harvest timber, or use the land for other purposes. Additionally the Mazama Forest Project would not be expected to contribute to any terrestrial resource effects generated by the hydroelectric facility removal action. **No changes to existing conditions for terrestrial resources are anticipated.**

Alternative 3: Partial Facilities Removal of Four Dams

Under the Partial Facilities Removal of Four Dams Alternative, only the primary structure of the four dams would be removed, while auxiliary dam and hydroelectric features would remain in place. Drawdown of reservoirs would still occur and sediment behind the dams would be flushed downstream by river flows. Following partial facilities removal, riverbank stabilization and replanting activities would be conducted and the KBRA would be fully implemented, as with the Proposed Action.

Temporary Construction Impacts

Temporary construction impacts on terrestrial resources under the Partial Facilities Removal Alternative would be very similar to those described for the Proposed Action. There would be temporary construction impacts that would adversely affect local populations of common plants and wildlife in construction areas. Elements incorporated into construction would avoid or reduce these effects. These effects would be short-term in nature and less than significant for most common species. Temporary construction impacts on special-status species would be similar to those under the Proposed Action.

Mitigation Measures *TER-1* through ***TER-4*** (Section 3.5.4.4) would be implemented, as necessary, to avoid or reduce impacts as under the Proposed Action. **Therefore, temporary construction impacts on terrestrial resources from the Partial Facilities Removal Alternative would be less than significant.**

Long-Term Impacts

As with the Proposed Action, there would be the same adverse effects related to loss of aquatic and wetland habitat at the reservoirs under the Partial Facilities Removal Alternative. **Mitigation Measure *TER-5*** would reduce impacts from permanent loss of wetlands, if it occurs, to less than significant. **Mitigation Measure *TER-6*** would reduce impacts on bats from the loss of roosting habitat from the removal of structures to less than significant. See Section 3.5.4.4 for a description of Mitigation Measures.

As described above for the Proposed Action, there would also be benefits to wildlife from gains in upland and riparian habitat following establishment of newly planted areas and with control and monitoring of invasive plants. Riparian habitat at the reservoirs would be restored and any riparian habitat destroyed by sedimentation downstream would be expected to re-establish within a few years; therefore, impacts on riparian habitat would be less than significant. Remaining PacifiCorp facilities would still pose a barrier to terrestrial wildlife movement in some places; however, drawdown of the reservoirs would benefit some terrestrial species by eliminating those barriers. Impacts related to invasive plants at the reservoir sites and other construction areas would be reduced to less than significant with implementation of the Reservoir Area Management Plan and Habitat Restoration Plan (**Mitigation Measure *TER-1***). **Therefore, long-term impacts on terrestrial resources from the Partial Facilities Removal Alternative would be less than significant.**

Keno Transfer

The effects of the Keno Transfer would be the same as those described for the Proposed Action.

East and West Side Facility Decommissioning

The effects of the East and West Side Facilities removal would be the same as those described for the Proposed Action.

KBRA

The Partial Facilities Removal Alternative would include full implementation of the KBRA. Therefore, impacts and benefits related to KBRA actions would be the same as under the Proposed Action, discussed above.

Alternative 4: Fish Passage at Four Dams

Under the Fish Passage at Four Dams Alternative, all four dams and hydroelectric facilities would remain in place and fish passage facilities would be constructed around each. Reservoirs would remain in place. The KBRA would not be implemented.

The provisions of the USFWS Biological Opinion (USFWS 2007) for the relicensing of the Klamath Hydroelectric Project may be in effect under the Fish Passage at Four Dams

Alternative. These include a number of environmental measures to address impacts on terrestrial resources. One is a vegetation resource management plan for restoration of disturbed sites and riparian habitat restoration, protection of special-status plants, and long term monitoring. In addition, a wildlife resource management plan would be required to provide: wildlife crossings, deer winter range management, a plan to address avian electrocution hazards, amphibian breeding habitat, bald eagle and osprey habitat, road closures, turtle basking sites, bat roosting structures, surveys for special-status species, and long term monitoring (USFWS 2007).

Temporary Construction Impacts

Short-term construction activities would occur associated with the installation of fish passage at the four dams. Construction areas would likely be similar to, but smaller than those required for demolition of all four dams under the Proposed Action or the Partial Facilities Removal Alternative. The same or similar elements would be incorporated into construction activities to avoid or reduce impacts on wildlife and plants, including special-status species, and sensitive habitats. **Mitigation Measures *TER-1*** through ***TER-4*** (Section 3.5.4.4) would be implemented, as necessary, to avoid or reduce impacts as under the Proposed Action. **Therefore, temporary construction impacts on terrestrial resources from the Fish Passage at Four Dams Alternative would be less than significant.**

Long-Term Impacts

Under the Fish Passage at Four Dams Alternative, reservoirs would remain in place and there would be no anticipated sedimentation in downstream reaches that would affect riverine areas. As with the No Action/No Project Alternative, the KBRA would not be implemented under the Fish Passage at Four Dams Alternative. Therefore, there would continue to be uncertainty regarding water deliveries to the NWRs, and subsequent impacts on terrestrial resources within the Lower Klamath NWR, Tule Lake NWR, and Upper Klamath NWR.

Although detailed plans are not yet available, construction of the fish passage facilities would not likely result in permanent loss of wetlands. There would also be no anticipated long-term impacts on terrestrial wildlife, including special-status species, from operation of the fish passage facilities. Existing barriers to terrestrial wildlife movement presented by the dams and associated facilities would remain. There would be potential for impacts related to invasive species in areas disturbed by construction, although much less so than under the Proposed Action, the Partial Facilities Removal Alternative, and the Fish Passage at Two Dams, Remove Copco 1 and Iron Gate Alternative where reservoirs are drawn down. Implementation of the Habitat Restoration Plan (**Mitigation Measure *TER-1*** (Section 3.5.4.4) in construction areas would avoid or reduce impacts related to invasive species. **Therefore, long-term impacts on terrestrial resources from the Fish Passage at Four Dams Alternative would be less than significant.**

Alternative 5: Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate

The Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative includes the removal of two of the Four Facilities (Copco 1 and Iron Gate). Copco 1 Reservoir and Iron Gate Reservoir would be drawn down. This alternative also includes development and/or improvement of fish passage at Copco 2 and J.C. Boyle Dams. Since the J.C. Boyle and Copco 2 Reservoirs store much less sediment than do the Copco 1 and Iron Gate Reservoirs, the amount of sediment released to the river system would be similar under the Fish Passage at Two Dams Alternative as under the Proposed Action.

Temporary Construction Impacts

Under the Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative there would be temporary construction impacts similar to those of the Proposed Action at the Copco 1 and Iron Gate facilities. Construction impacts would also occur at Copco 2 and J.C. Boyle with the construction of fish passage facilities there. Construction areas would likely be smaller than those required for demolition of all four dams under the Proposed Action or the Partial Facilities Removal Alternative. The same or similar elements would be incorporated into construction activities to avoid or reduce impacts on wildlife and plants, including special-status species, and sensitive habitats. **Mitigation Measures *TER-1*** through ***TER-4*** (Section 3.5.4.4) would be implemented, as necessary, to avoid or reduce impacts as under the Proposed Action. **Therefore, temporary construction impacts on terrestrial resources from the Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative would be less than significant.**

Long-Term Habitat Loss and Modification

Under the Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative, two reservoirs would remain in place and two would be drawn down. As with the No Action/No Project Alternative, the KBRA would not be implemented under the Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative. Therefore, there would continue to be uncertainty regarding water deliveries to the NWRs, and subsequent impacts on terrestrial resources within the Lower Klamath NWR, Tule Lake NWR, and Upper Klamath NWR.

Although detailed plans are not yet available, construction of the fish passage facilities would not likely result in permanent loss of wetlands. **Mitigation Measure *TER-5*** (Section 3.5.4.4) would reduce impacts from permanent loss of wetlands, if it occurs, to less than significant. In addition, permanent loss of wetlands at Copco 1 and Iron Gate Reservoirs would be offset by restoration activities. As described above for the Proposed Action, there would also be benefits to wildlife from gains in upland and riparian habitat at Copco 1 and Iron Gate Reservoirs following establishment of newly planted areas and with control and monitoring of invasive plants.

As with the Proposed Action, there could be sedimentation in downstream reaches that would have impacts on riparian areas, although this is anticipated to be short-term and not considered a significant long-term impact (Stillwater 2008). There would be impacts on terrestrial wildlife, including special-status species, from the loss of aquatic habitat at the Copco 1 and Iron Gate Reservoirs, but these impacts would be less than significant,

as described for the Proposed Action. **Mitigation Measure *TER-6*** (Section 3.5.4.4) would reduce impacts on bats from the loss of roosting habitat to less than significant. Some vegetation that provides habitat for terrestrial species would be removed, but elements incorporated into construction and **Mitigation Measure *TER-1*** (Section 3.5.4.4) would avoid or reduce these impacts to less than significant, as with the Proposed Action. Existing barriers to terrestrial wildlife movement presented by the two remaining dams, Copco 2 and J.C. Boyle Dams, would remain. Implementation of the Habitat Restoration Plan in construction areas would avoid or reduce impacts related to invasive species. **Therefore, long-term impacts on terrestrial resources from the Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative would be less than significant.**

3.5.4.4 Mitigation Measures

Mitigation Measure by Consequence Summary

TER-1: Habitat Restoration Plan

To restore native vegetation communities and wildlife habitat in areas disturbed by construction, a Habitat Restoration Plan will be developed once the Definite Plan is prepared and construction areas are delineated. The Habitat Restoration Plan will be separate from the Reservoir Area Management Plan (DOI 2011a), which describes restoration of the reservoir areas. The Habitat Restoration Plan will cover all areas disturbed by construction, including upland sediment disposal sites, access and haul roads, pipeline corridors, and equipment staging areas. The Habitat Restoration Plan will include maintenance and monitoring requirements to be conducted for a minimum of three years following hydroseeding and/or planting of native species in areas disturbed by construction. Measures to remove and control noxious weeds and other invasive plants will be included. The Habitat Restoration Plan will outline the performance standards to be met, and the corrective actions to be taken if performance standards are not met.

TER-2: Nesting Bird Surveys[5]

If, during preconstruction surveys, an active nest of a special-status bird species (e.g., northern spotted owl, osprey, willow flycatcher) or migratory bird is identified, a restriction buffer would be established in consultation with the resource agencies to ensure nests are not disturbed from construction. This may include evaluation of noise levels at the nesting site for special-status species such as northern spotted owl. Once the Definite Plan is prepared and construction areas are delineated, detailed plans for nesting bird surveys and measures to be implemented if active nests are found will be developed in consultation with USFWS, ODFW, and CDFG. See **Mitigation Measure *TER-3*** for mitigation related to bald and golden eagles.

Table 3.5-5 lists the restriction buffers for many common raptor species with potential to occur within or near construction areas. *Buffer zones* are defined as seasonal or spatial

[5] The discussion presented in this section includes both BMPs that would be incorporated during construction as well as mitigation measures in order to facilitate the development of compliance documentation for the Bald and Golden Eagle Protection Act. These BMPs are also described in Appendix B.

areas of inactivity in association with individual nests or nesting territories. *Spatial buffers* are defined as radii from known occupied and unoccupied nest sites. *Seasonal buffers* are restrictions on the times when human activities may occur within the spatial buffers (USFWS 2002). All restriction buffers would be established as appropriate and in consultation with USFWS, ODFW, and CDFG.

Table 3.5-5. No Surface-Disturbing Activity Spatial Buffers and Seasonal Timing Restriction Stipulations for Raptor Nests

Species	Spatial Buffer (miles)	Seasonal Timing Restriction
Bald eagle	1.00	Jan 1 – Aug 31
Golden eagle	1.00	Jan 1 – Aug 31
Northern goshawk	0.75	March 1 – Aug 15
Northern harrier	0.75	April 1 – Aug 15
Cooper's hawk	0.75	March 15 – Aug 31
Ferruginous hawk	1.00	March 1 – Aug 1
Red-tailed hawk	0.75	March 15 – Aug 15
Sharp-shinned hawk	0.75	March 15 – Aug 31
Swainson's hawk	0.75	March 1 – Aug 31
Turkey vulture	0.75	May 1 – Aug 15
Peregrine falcon	1.00	Feb 1 – Aug 31
Prairie falcon	0.75	April 1 – Aug 31
Merlin	0.75	April 1 – Aug 31
American kestrel	0.05 (300 feet)	April 1 – Aug 15
Osprey	0.75	April 1 – Aug 31
Burrowing owl	0.25 to 0.75	March 1 – Aug 31
Flammulated owl	0.75	April 1 – Sept 30
Great horned owl	0.75	Dec 1 – Sept 30
Long-eared owl	0.75	Feb 1 – Aug 15
Northern saw-whet owl	0.75	March 1 – Aug 31
Short-eared owl	0.75	March 1 – Aug 1
Northern pygmy-owl	0.75	April 1 – Aug 1
Western screech-owl	0.75	March 1 – Aug 15
Barn owl	0.062 to 0.25	Feb 1 – Sept 15

Source: USFWS 2002

When active raptor nests (with eggs or young) are located within the disturbance buffer for that species, and if construction is scheduled to occur in the vicinity during the nesting period, then additional considerations will include the following:

- Line-of-sight considerations- if the nest is visually obscured from construction activities by substantial vegetation (i.e., a forest or woodlot), or by geographic relief (e.g., a ridgeline), or any other type of visual barrier, then construction may continue. However, the nest will be monitored continuously throughout the nesting season to assure that the birds are not disturbed to a level that jeopardizes or alters the outcome of the nest. Initially, the birds will be monitored for signs of disturbance, and bird behavior will be compared to pre-construction levels. Monitoring in these cases will include determining and reporting to USFWS the ultimate fate of the nest. Birds nesting in locations that are visually protected from the construction site are not automatically protected from disturbance; their level of response to disturbance will depend on the species, tolerances of individual birds, type of activity, noise level, and distance from the activity. If birds appear to be disturbed by construction, regardless of species, then the USFWS Migratory Bird Program will be contacted to seek solutions to this issue.

TER-3: Impacts to Nesting Habitat of Bald and Golden Eagle and Other Migratory Birds[6]

Mitigation to reduce impacts on Bald and Golden Eagle and Other Migratory Birds from loss of nesting habitat will include the following:

- Complete a two-year survey for bird use patterns prior to construction activities. Surveys will be conducted by a qualified avian biologist and will include any facilities to be removed or modified to determine bird use patterns. Surveys will be conducted during the time of year most likely to detect bird usage;

- Before approval of any site specific implementation plan, develop an Eagle Conservation Plan in coordination with USFWS;

- If deemed necessary and before approval of any site specific implementation plan, a permit from the USFWS will be obtained if project activities are anticipated to result in take under the Bald and Golden Eagle Protection Act.

Mitigation to Avoid Mortality and Disturbance
If surveys indicate part of the construction footprint or facilities slated for removal is utilized by bald or golden eagle or other migratory bird, then these mitigations will be employed to minimize disturbance and mortality to those birds:

- Where ever possible, clearing, cutting, and grubbing activities shall be conducted outside the eagle breeding period (January 15 through August 15);

[6] The discussion presented in this section includes both BMPs that would be incorporated during construction as well as mitigation measures in order to facilitate the development of compliance documentation for the Bald and Golden Eagle Protection Act. These BMPs are also described in Appendix B.

- Where clearing, cutting, and grubbing work cannot occur outside the migratory bird nesting season (March 20 through August 20), a qualified avian biologist shall survey those areas to determine if any migratory birds are present and nesting in those areas;

- If nesting migratory birds/eagles are found, one of the following measures shall be taken to minimize impacts to nesting birds; 1) modification of the project footprint to avoid the nest permanently, 2) protection of the nest until the young have fledged, or 3) implementation of measures included in the Eagle Conservation Plan in coordination with USFWS.

Monitoring Measures to Determine Success and Corrective Action Measures
If project activities are anticipated to result in take under the Bald and Golden Eagle Protection Act, five years of monitoring by qualified avian biologists will be conducted following completion of deconstruction activities. The mitigation will be deemed successful if there is no net loss of eagles within the project area.

If this standard is not met, the Dam Removal Entity will consult with the USFWS and CDFG or ODFW, as appropriate, to ascertain the potential need for further mitigation.

TER-4: Special-Status Plants

Once the Definite Plan is prepared and construction areas are delineated, detailed plans for protocol-level surveys for special-status plants will be developed in consultation with USFWS, ODFW, and CDFG. If, during preconstruction surveys, any special-status plants are found to occur within the construction areas, the size and location of all identified occurrences would be mapped on the final construction plans, and impact acreages would be quantified based on proposed limits of disturbance. Compensation measures are expected to be a combination of the relocation, propagation, and establishment of new populations in conservation areas within the project site at a 1:1 ratio or at a 2:1 ratio in approved off-site habitat preservation areas, as determined in consultation with the resource agencies.

TER-5: Permanent Loss of Wetlands at Reservoirs

Under the Proposed Action, the Partial Facilities Removal Alternative, and the Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative, there would be loss of wetlands from the drawdown and permanent removal of reservoirs. Based on PacifiCorp surveys (PacifiCorp 2004a), there could be unavoidable impacts on 245 acres of wetland habitat at the J.C. Boyle, Copco 1, Copco 2, and Iron Gate Reservoirs (Table 3.5-2). If it is determined that under the Clean Water Act a Section 404 Permit is required, a Compensatory Wetland Mitigation Plan will be developed and implemented in accordance with the requirements of the United States Army Corps of Engineers (USACE).

If one is required, the Compensatory Wetland Mitigation Plan will include creation and/or preservation of wetlands at an off-site conservation bank or other approved mitigation site in consultation with USACE and the resource agencies. Compensation

wetlands will be required to meet or exceed the functions and quality of the wetland habitat lost at the reservoirs. A monitoring plan will be required to assess whether the compensation wetlands are functioning as intended. Specific performance standards for hydrologic, floral, and faunal parameters will be proposed to determine success of the created wetlands. The monitoring plan would specify the corrective measures/ modifications to be implemented in the event that monitoring indicates that the performance standards are not being met. Monitoring will occur for at least five years and until success criteria are met, and as required by USACE and the resource agencies.

In addition, a maintenance plan will be required for the wetland preservation/mitigation areas describing the measures to be implemented to assure that they are maintained as wetland habitat in perpetuity. The maintenance plan will address buffering from adjacent uses, fencing, access erosion control, and weed eradication.

TER-6: Impacts on Special-Status Bats from Loss of Roosting Habitat

Mitigation to reduce impacts on special-status bats from loss of roosting habitat will include the following:

- For the two years immediately prior to construction activities, qualified bat biologists will conduct bat surveys at facilities to be removed or modified to determine bat use patterns. Surveys will be conducted during the time of year most likely to detect bat usage.

Mitigation to Avoid Mortality and Disturbance

If surveys indicate a facility is utilized as a bat roost, then one of two mitigations will be employed to minimize disturbance and mortality to roosting bats:

- The facility shall be removed or modified outside the bat roosting and breeding period (November 1 to March 1); or

- Bat exclusion methods to seal-up facility entry sites (e.g., blocking and netting or installing sonic bat deterrence equipment) will occur prior to March 1 of the year the facility will be removed or modified.

Mitigation for Loss of Roosting Habitat

To reduce impacts on bats from the permanent loss of roosting habitat, five free-standing bat roosts will be constructed in consultation with bat specialists and the resource agencies. Experienced contractors will perform the installation of bat roosts. The structure will be placed in full sun at least 30 feet above ground. The structure will be concrete with high thermal mass and will meet the specifications of Bats in American Bridges (Keeley and Tuttle 1999) and California Bat Mitigation Techniques, Solutions, and Effectiveness (H.T. Harvey and Associates 2004).

Monitoring Measures to Determine Success and Corrective Action Measures

Five years of monitoring by qualified bat biologists will be conducted following installation of the bat roosts to determine the pattern and amount of use by bats. The mitigation will be deemed successful if one or more of the bat roosts, are utilized by at

least 600 bats (combined use at all five facilities) as either day or night roosts, or some combination, for at least two years.

If this standard is not met, the Dam Removal Entity will consult with the USFWS and CDFG or ODFW, as appropriate, to ascertain the potential need for further mitigation.

Effectiveness of Mitigation in Reducing Consequence

Proposed mitigation measures would be effective in reducing impacts on terrestrial resources to less than significant. Effectiveness would be evaluated through monitoring incorporated into the mitigation measures. If monitoring results indicate that mitigation measures are not effective in reducing impacts, corrective action would be taken, as described in the mitigation measures.

Agency Responsible for Mitigation Implementation

The Dam Removal Entity will be responsible for implementing the mitigation measures.

Remaining Significant Impacts

With the implementation of mitigation measures, there would be no significant impacts to terrestrial resources.

Mitigation Measures Associated with Other Resource Areas

Several other mitigation measures involve construction work, including mitigation measures H-2 (flood-proof structures), GW-1 (deepen or replace affected wells), WRWS-1 (modify or screen affected water intakes), REC-1 (develop new recreational facilities and access to river), TR-6 (assess and improve roads to carry construction loads), and TR-7 (assess and improve bridges to carry construction loads). During these construction activities, there could be impacts on terrestrial resources, including impacts on special-status species, wetlands, or effects related to the spread of invasive plants. Elements incorporated into construction would avoid or reduce these effects, as described for the Proposed Action. **Mitigation Measures *TER-1*** through ***TER-5*** (Section 3.5.4.4) would be implemented, as necessary, to avoid or reduce impacts. **Therefore, impacts on terrestrial resources from mitigation measures associated with other resource areas would be less than significant.**

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